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EXTREME PHYSICAL PHENOMENA DURING THE TROJAN WAR

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ABSTRACT

The Homeric Epic, Iliad, describes the Trojan War's events during a period of only seven days around Patroclus' death. These events are initiated after Athena's appearance as a shooting star. During this period, the poet describes in detail various physical phenomena, which attributed to the gods. Zeus' thunderbolts in a clear sky, 'divine' screams, a fallen thunder stone inducing odor of sulphur, sporadic yellow, red and dark clouds appearing out of nowhere, red droplets are falling from the sky, river Xanthus is flooding and turns into red, Hephaestus' 'flames' ignite fires, whereas seismic activity and raising of the sea level are recorded. The above phenomena can be explained as a consequence of the local weather's circumstances and landscape peculiarities, as well as due to the partial solar eclipse's manifestation, which occurred during the same period. We analysed all these descriptions in detail and we concluded that an intense astronomical phenomenon like a meteor shower including some fireball's explosions is indicated by the poet, in parallel with the Trojan War's combats. This is in accordance with the mythological account of a comet's appearance during Troy's fall, because meteor showers produced by the remnants of the comets, when they approach to the Sun.

KEYWORDS: Iliad, Odyssey, meteors, bolides, fireballs, eclipses, seismoacoustic coupling, seismotectonic activity

1. INTRODUCTION

The Homeric Epic, Iliad, describes the Trojan War's events during a period of only seven days, approximately one or two months before Troy's conquest, althought the Trojan War lasts for ten years according to the Homeric epics. During this period of seven days, the following events take place: a) the departure of Achilles from the battle and the Achaeans' total defeat in the war, as well as the killing of Achilles' friend, Patroclus, by Hector (described in *four days*) b) Achilles' return in the battle and Hector's killing by him (described in *one day*) c) Achilles pays tribute to Patroclus' death and offers Hector's body to Priamus (described in *two days*). Homer does not mention in Iliad the period in association with Achilles' death neither Troy's conquest.

The epic starts presenting the Greeks and the Trojans tired from the calamities of the war. The warriors decided to stop the war by setting the two opponents over Helen's fate, Menelaus and Paris, to fight in a duel. They proposed that whoever was the winner he would take Helen and the armies will have to be retreated. The duel was performed and Menelaus won. However, the goddesses Hera and Athena had different opinion. They wanted the war to start again. Zeus accepted their will and sent Athena in the battle field. Indeed, Athena flew from Olympus as a *glitter star emanating infinite sparks* and appeared in the battle field. The glitter star phenomenon was *visible* under the *daylight*, because the battles' were conducted *only* during the *day*. The latter means that the heavenly body was *very bright*. It did not touch the ground and it did not erupt. It had only an *exceptional brightness*. Homer mentions that heavenly phenomena were known to the sailors which they were the sky's excellent observers because they used to watch the heavenly bodies as navigation's guides.The warriors *'interpreted'* this exceptional heavenly phenomenon as divine 'sign'. It was *Athena's personalization* as she arrived in the battle field (Il.4.73-80):

'*Ὣς εἰπὼν ὄτρυνε πάρος μεμαυῖαν Ἀθήνην, βῆ δὲ κατ' Οὐλύμποιο καρήνων ἀΐξασα. οἷον δ' ἀστέρα ἧκε Κρόνου πάϊς ἀγκυλομήτεω ἢ ναύτῃσι τέρας ἠὲ στρατῷ εὐρεῖ λαῶν λαμπρόν· τοῦ δέ τε πολλοὶ ἀπὸ σπινθῆρες ἵενται· τῷ ἐϊκυῖ' ἤϊξεν ἐπὶ χθόνα Παλλὰς Ἀθήνη, κὰδ δ' ἔθορ' ἐς μέσσον· θάμβος δ' ἔχεν εἰσορόωντας Τρῶάς θ' ἱπποδάμους καὶ ἐϋκνήμιδας Ἀχαιούς.*'

'*So saying, he stirred on Athene, who was already eager, and down from the peaks of Olympus she darted. Just as the son of crooked-counseling Cronos sends a star to be a portent for seamen or a wide army of warriors, a gleaming star, and from it the sparks fly thick; so darted Pallas Athene to earth, and down she leapt into their midst; and amazement came on all who saw her, on horse-taming Trojans and well-greaved Achaeans*'

Papamarinopoulos (2008) mentioned this scene and he wondered whether this was a *comet's* description. Indeed, there was a mythological reference of Electra, Dardanus' mother and Troy's founder, which was presented flying in the sky with *her hair flowing freely in it*, during Troy's conquest (e.g. Stagiritis, 1815). Electra's appearence as a heavenly body has a good similarity with a *comet's manifestation* according to the author. However, the Iliad's battle events occur only within seven days, just one or two months *before* Troy's conquest. During these days, Homer described Athena's brief appearance as a 'sparking star'and not Electra's appearence as a 'comet'. Morover, it is known that a comet is usually visible for either hours or days, and therefore it can be observed for a long time.

Athena's rapid behavior is understood from the phrases '*κατ' Οὐλύμποιο καρήνων ἀΐξασα*' (from the peaks of Olympus she darted*)* and '*ἤϊξεν ἐπὶ χθόνα Παλλὰς Ἀθήνη' (*so darted Pallas Athena to earth*)*. The word '*ἀΐξασα*' originates from the verb '*αἴσσω*' which means *hurl* or *move fast*. In other words, Athena *hurled* from Olympus to the Troad, like a fast *'gleaming star, and from it, sparks fly thick'*. Also, the phrase '*κὰδ δ' ἔθορ' ἐς μέσσον*' is interpreted as *'and down she leapt into their midst'. The verb '*ἔθορε*' is past tens of the* verb *'θρώσκω'* and it has the prefix '*κατά*' in front of it. This means '*she jumped downwards*'. With this phrase, Homer describes Athena's appearance, with respect to the observer's horizon in the Troad, as suddenly hurled from the *Olympus,* and as such, was fast moving descending from a *higher* elevation (*κατά*+*ἔθορε* which becomes *κὰδ δ' ἔθορε*) to a *lower* one.

If Athena's appearance was a comet's description, meaning that it has reached such a low altitude with respect to the ground, the Trojan War would have finished immediately due to the Troad's plain unprecedented catastrophe. Such a very fast appearance of a '*sparking star*' in the sky matches well with the shooting star's manifestation; some of the brightest shooting stars, can be visible during daylight. A subcategory of shooting stars is characterized as *earthgrazers* and is described as follows: 'Earthgrazers are long, bright shooting stars that streak overhead from just below the horizon. They often display colorful halos and long-lasting trails. Earthgrazers are so distinctive because they follow a path nearly parallel to the ground, depending on the observer's location and his view with respect to the horizon' (www.spaceweather.com). The above description fits well with the behavior of an earthgrazer shooting star. They appear in low altitude above the horizon and moves horizontally in the upper atmosphere near to horizon offering to the observer the illusion as almost touching the ground. Consequently, a

'sparking star-earthgrazer shooting star' appeared in the daylight compelling all the warriors to be amazed by the heavenly visitor.

This is another astrophysical phenomenon which is described in the Homeric Epics (Theodosiou et al, 2011) and it is attributed to Zeus according to the prevailing theological ideas of prehistoric antiquity. The latter means that god Zeus has the responsibility of everything falling from the sky including *meteors, shooting stars*, besides the known *thunders.* Indeed, Papamarinopoulos et al (2013) indicated that a meteor shower described in the Odyssey and three '*Zeus' type thunders*' occurred in an otherwise clear sky. These thunders were not of atmospheric origin but they were three big and bright eruptive meteors. One of them was accompanied by a meteorite's impact on the ground. In the Iliad, the clear description of the shooting star which sent by Zeus, confirms the above reference in the Odyssey.

Apart of the previously mentioned phenomenon Patroclus' death coincides with another astronomical phenomenon, *a solar eclipse*, as it is proposed by Henriksson (2012) and Papamarinopoulos et al. (2014). The proposed, by the authors, dates for this solar eclipse are 11 June 1312 B.C. (Gregorian calendar) and 6 June 1218 B.C., respectively. Both publications indicated that the first scene, on the Achilles shield, describes Troy's sky during the solar eclipse's manifestation. The referred constellations in this scene marked the solar eclipse's position in the sky.

It is noticeable that *the above mentioned solar eclipse* is followed by another observed *solar eclipse ten years after* which is described in detailed in Odyssey, as indicated firstly by Heraclitus of Pontus (Allegories, 75, 1, 1-9, 3). Schoch (1931), Papamarinopoulos (2008) and Baikouzis and Magnasco (2008) proposed the date of 16 April 1178 B.C. for the Odyssey's eclipse. However, Papamarinopoulos et al (2012) proposed the date 30 October 1207 B.C., after taking into account all the text's details such as the climate conditions, agricultural and bucolic scenes, the long-lasting nights, Laertes' type of life in the field and the described astronomical phenomena (observation of specific constellations all the night, the *'ὀψὲ δύων Βοώτης*-late set Bootes' period (see also Aratus of Soli, Phaenomena and Diosemeia, 579-585) and the visibility of planet Venus in the east before sunrise). All of them were not compatible to the spring but to the autumn. Moreover, the two proposed solar eclipses of 6 June 1218 and 30 October 1207 B.C. (proposed for the eclipses described in Iliad and Odyssey respectively) have a time separation of ten years. On contrary, Henriksson's proposed solar eclipse does not satisfy the Homeric text (see Papamarinopoulos et al. (2014)).

Table 1: Display of the War's years and Odysseus' return

1227-1226 B.C.	Trojan War's 1st year
1218-1217 B.C.	Trojan War's 10th year
1208-1207 B.C.	Odysseus' return to Ithaca, twenty years after his departure

* Every Homeric 'war year', as a time period, is counted between two successive spring or/and summer periods, because wars were not conducted in the winter.

We additionally mention, that through-out the prehistoric and historic period of Greece there was not a unanimous calendar for both the Achaean Kingdoms and city states. Table 1 presents this *common period*, mentioned by Homer, which is not depended on any particular prehistoric calendar but it was connected only with the activities during *the Trojan War*. It is also known that the battles were not conducted during the *winter.* Consequently, the *war's activities 'year', as a time period*, started during the spring or in the summer and ended in the next successive *season*. According to Papamarinopoulos et al. (2014), the *1st year* of Trojan War was between *1227-1226 B.C.* and the *10th year* was between *1218 and 1217 B.C.*. Moreover, according to Calchas, Agamemnon and Odysseus (Il.2.328-330, Il.2.134-138, and Il.2.295-296), the events described in Iliad occurred *at the beginning* of the *10th* year of the Trojan War. Consequently, the general *war's activities* and *Troy's conquest* occurred in the *spring/summer* of 1218 B.C.

According to the description of Achilles' shield, the first scene presents the constellations which surrounded the celectial location of the solar eclipse, as indicated by Henriksson (2012) and Papamarinopoulos et al. (2014). Homer also poetically describes the hero's shield (Il.19.373-398) as the *Moon-Μήνης* ('from which went out afar a gleam as of the moon'), Achilles in his panoply as the *Sun-ἠλέκτωρ Ὑπερίων* ('*And behind him stepped Achilles armed for battle, gleaming in his armor like the bright Hyperion*') and his helmet as a *shooting star-αστήρ ως ἀπέλαμπεν* ('*it shone like a star, the helmet with crest of horsehair, and around it waved the plumes of gold*').

Achilles' *helmet* and his hair are described by the poet, as a *sparking star ('ἀστὴρ δ' ὣς ἀπέλαμπεν')*. His *hair*, in particular, is presented, as *thick braids of gold* (*'πυκνὲς χρυσὲς πλεξούδες') wiggling* around as *the sparks of the shooting star*. The description of Achille's helmet and shield, in *combination*, remind us the spectacular shooting star, which appeared *three days before* Patroclus' death and signaled the commencing of the war. This astronomical event eventually led to Patroclus' death. Moreover, Homer presents Achilles with his new *armour* as the *Sun* and calls him *ἠλέκτωρ Ὑπερίων (Elector-Hyperion=Sun*). The bright solar disc is Achilles' body, dressed with his shining panoply.

It is *shadowed,* however, by his *shield* existing *in front* of him. Homer calls that *shield* deliberately Moon (*μήνης = Moon)*. The *Sun*, Achilles, is covered by the *Moon*, his *shield*. In other words the observed solar eclipse's phenomenon is presented symbolically (Figure 1).

Figure 1. (Top): Partial solar eclipse, observed from Embu, Kenya by one of the authors (K. Gazeas) on 15 January 2010. (Middle): Achille's modern statue in Kerkyra Island is shown. Homer mimicked the phenomenon on Achilles by calling his new shield-moon-and his new shining panoply-sun.The shield-moon-is in front, of Achilles-the sun-, as in the statue. Homer's emphasis in Achilles' shining panoply, as the sun, illustrates the sun's visibility due to the partial solar eclipse, observed obviously in the Trojan battle. The poet also mimicked Achilles's shining new helmet with his 'golden' wiggling hair in the air, as a sparking star. (Bottom): A large fireball hurtles to Earth during the annual Geminid meteor shower. The picture was taken by Wally Pacholk from the Mojave Desert area near Victorville. (Daily Mail, December 2009 http://fireballs-eteorites.blogspot.gr/2009/12/december-2009.html).

Homer *allows* the *mimesis* of these *phenomena,* the shooting star and the solar eclipse to be '*visible*' again in the minds of his readers who listen or read his poem. He does it, by combining these *unique astronomical* phenomena into one person, the *unique warrior Achilles*. These phenomena were impressive in the minds of the early years' observers. They are both, focused on Achilles because they are associated, with Patroclus' loss, his friend. The first is the amazing shooting star which signaled the war's beginning leading to *Patroclus' death*. The second occurred *at the peak of the drama*, described in the Iliad; the death of his beloved friend *coincided* with the *solar eclipse*. After these two consecutive events, Achilles enters the battle field, ready to take revenge.

During the seven days of the epic, several more phenomena are described, in addition to those mentioned above. Zeus' thunderbolts occurred in a clear sky and 'divine' screams were heard engulfing the warriors in terror. A thunderbolt with the sulphuric odor impacted the ground. Dark, yellow and red clouds appearred locally out of nowhere, sometimes connected with odor. 'Red droplets' were falling from the sky, Xanthus River's waters were flooding and turned red, Hephaestus' 'flames' were falling from the sky, while tremors and rising of the sea level were recorded.

In this paper, we try to identify and analyse the epic's descriptions, having in mind what Plutarch (Fragmenta 157), the Delphic priest wrote: 'The *old physical science* for both, the Greeks and the Barbarians is *natural logos* hidden deeply within myths and theology'. In other words we shall search to find 'the old physical science' and the phenomena related with it, which are presented *hidden deeply* behind *divine* interventions. Athena's *divine* interference in the battlefield, for instance, was a myth by poetic allowance. However, it contains a true physical event, an exceptionally bright *earthgrazer shooting star*.

2. BRIEF DESCRIPTION OF THE PHENOMENA

In the Iliad, five references of *Zeus' thunders* are described. However, according to Homer's description, the weather conditions do not match with any kind of storm. During the first day, a cool north wind is described (Il.5.697-698), while the next days are characterized by very hot atmospheric conditions and calmness (Il.10.570-575, Il.11.621-622, Il.11.642, and Il.11.811-812). Only at the sixth day the weather changes to NW direction (Il.23.194-195). While battles are carried out, there is no reference of any storm. In addition, it is known that the battles did not take place during the winter. During spring and summer, storms may sporadically occur in the area of Troad. Moreover, the dates for the Iliad's events as proposed by Henriksson (2012) and Papamarinopoulos et al. (2013) correspond to a typical warm summer.

Three more passages describe events, in which '*sudden moving clouds*' accompanied by strong '*divine screams'*, appeared. There are two additional descriptions with similar characteristics, which present further complexity. The first event is the red droplets, falling from the sky and the appearance of a red cloud. The second event exhibits the flooding of Xanthus' River, the changing of its waters' color into red and the warriors' feeling of the ground tremors.

All these events, including Athena's appearance like a shooting star, are tabulated in sequence, as they are presented in the Homeric text and shown in the Table 2 (A, B and C).

3. PHENOMENA PROCEEDING PATROCLUS' DEATH

During the day in which Athena appeared as a *shooting star* (number 1, Table 2A), Mars roared few hours later '*as nine or ten thousand warriors'*, because Athena injured him. The latter spreads terror in the armies, (number 2, Table 2A). Simultaneously, Mars *engulfed* himself with a '*black darkness'* as fire does, producing hot air and black smog. This strong powerful sound like a prolonged 'roar', with smog's appearance fits well with a '*fireball's breakage'*. Homer seems to associate Mars' manifestation (fireball's breakage) with Athena's appearance, as a shooting star, connecting the latter with Mars' 'wound' (Il.5.859-867):

ὃ δ' ἔβραχε χάλκεος Ἄρης ὅσσόν τ' ἐννεάχιλοι ἐπίαχον ἢ δεκάχιλοι ἀνέρες ἐν πολέμῳ ἔριδα ξυνάγοντες Ἄρηος. τοὺς δ' ἄρ' ὑπὸ τρόμος εἷλεν Ἀχαιούς τε Τρῶάς τε δείσαντας· τόσσον ἔβραχ' Ἄρης ἆτος πολέμοιο. Οἵη δ' ἐκ νεφέων ἐρεβεννὴ φαίνεται ἀὴρ καύματος ἐξ ἀνέμοιο δυσαέος ὀρνυμένοιο, τοῖος Τυδεΐδῃ Διομήδεϊ χάλκεος Ἄρης φαίνεθ' ὁμοῦ νεφέεσσιν ἰὼν εἰς οὐρανὸν εὐρύν.

Then brazen Ares bellowed loud as nine thousand warriors or ten thousand cry in battle when they join in the strife of the War god; and trembling came over Achaeans and Trojans alike, and fear took hold them; so mightily bellowed Ares insatiate of war. Just as a black darkness appears from the clouds when after heat a blustering wind arises, so to Diomedes, son of Tydeus, did brazen Ares appear as he went among the clouds to broad heaven.

Table 2A: Homeric scenes and proposed physical events which are including within 1st to 4th days.

number	number of day	described event/passage	proposed physical event
1	1st day	Athena's appearance like an exceptional bright star emanating infinite sparks (Il.4.73-86).	*Appearance of an earth grazer bright shooting star in the Troad.*
2	1st day	Mars was injured by Athena and his scream was terrible. The armies were in terror. He left covered in a dark cloud (Il.5.859-866).	*Fireball's breakages and trajectory of its debris.*
3	2nd night	Zeus' thunders cause terror among the Achaeans.They make libations to Zeus.	*Fireball's breakages*
4	3rd day	Zeus' thunder originated from Ida mountain. It blazed flash into the warriors who were dazzled and terrified (Il.8.75-77). Zeus hurled a white thunder, from Ida mountain, and let it to crash on the ground in front of the horses emitting flame and releasing sulfur. The horses bolted and the charioteers were panicked (Il.8.133-136).	*Two almost simultaneously scrap bolide's explosions directed from Ida Mountain to the Troad. In the second case, a burning meteorite smelling sulphur crashed on the ground.*
5a	4th day at dawn	Zeus sent Eris to the Achaeans' ships-she holds a war's portent screaming terribly (Il.11.3-12). Immediately after that, *simultaneously*, Athena and Hera hit the ground (Il.11.45-46). Zeus roused an evil agitation and he trickled blood drops from the sky (Il.11.52-54).	*A bolide's remnant impacts on the ground, somewhere near the ships. The produced dust grains from the bolide's dissintegration are mixed with the early morning's moisture due to the very hot day. The mixture being in condensation falls down as red drops. The colour depends on the bolide's chemical composition.*
6	4th day	God Poseidon from mount Samos peak of Thrace arrived in Troad. The high mountains and the woodland are trembled (Il.13.10-19). Poseidon's terrible scream equally in intensity as Ares' scream in the first day was heard (Il.14.147-151). Hera moves quickly from Lemnos and Imbros, clothed in mist and arrived to Lectum (opposite to Lesbus). The topmost forest trembled beneath her feet. (Il.14.281-285). Hera climbed to Ida's peak, Gargaron, and Zeus covered it with a gold thick cloud (Il.14.342-345, 350-351). The sea surged up to the huts and ships of the Achaeans (Il.14.392).	*A fireball's breakages whose heard in the Troad. Its debris' trajectory was visible above Imbros island as a mist cloud leading toward Lectum (from West to South) and reach Gargaron (Ida's peak). The fireball's remnants appeared as a golden cloud on Ida's mountain peak. Simultaneously, an earthquake occurred and it was felt in the entire region of Asia Minor's coast. A typical consequence of a submarine epicentre is the sea's surging up to the beach.*
7	4th day	Zeus thundered from Ida Mountain answering to Nestor's prayer (Il.15.377-378).	*Fireball's breakage in Ida Mountain.*

Table 2B: Homeric described scenes and proposed physical events around Patroclus's death

number	number of day	described event/passage	proposed physical event
5b	4th day at noon	For the second time, Zeus trickled red drops (Il.16.458-459).	*This is a continuation of the phenomenon previous described in 5a. The difference with it is the solar eclipse's occurrence at noon. During the solar eclipse, the temperature is drastically reduced and the moisture is increased. As a consequence the remaining remnants of the bolide fall dawn as red drops.*
5c	4th day at noon	Zeus sends Athena like a red cloud (mist) in the battlefield. This mist sits on the ground (Il.17.543-552).	*These conditions mentioned above assist the red grains (see 5a and 5b) to pill up in the atmosphere and to fall dawn on the battlefield as reddish fog during the maximum phase of the solar eclipse.*
8	4th day at noon	Zeus covered Ida Mountain with clouds and he thundered with lighting from it (Il.17. 593-596).	*Bolide's explosion*
9	4th day at noon	Achilles stead above the trench and Athena set around his head a golden cloud with a gleaming flame. Also, the goddess strengthen Achilles' scream. The horses scared and the charioteers panicked (Il.18.184-229). The sun had set prematurely due to Hera ((Il.18.239-240).	*A fireball's impact on the ground caused a fire. A golden dust cloud containing the remnants of the fireball was emanated in the atmosphere. The flame from the fire is engaged by the dust cloud. The golden cloud and the fire's smog caused the darkening of the atmosphere and the warriors thought that the sun set prematurely.*

During the second night, after the *'sparking star's appearance'* while Achaeans enjoy a rich dinner, they hear Zeus' thunders and they gave explanations among themselves that it was a bad omen (number 3, Table 2A). They were afraid and made libations to Zeus (Il.7.478-479):

'παννύχιος δέ σφιν κακὰ μήδετο μητίετα Ζεὺς σμερδαλέα κτυπέων· τοὺς δὲ χλωρὸν δέος ἤρει …'

'And all night long Zeus, the counselor, devised them evil, thundering terrifyingly. Then pale fear seized them…'

These very strong sounds *without lightnings* were experienced at night by the warriors, who, in turn, got frightened and thought that they came from a *distant ongoing storm*. But in this case they would have seen the lightning prior to the thunder. Homer, however, does not mention any lighting in the text. Only Zeus's 'bangs' are described. Thus, the phenomenon has no meteorological origin. It can be easily explained as a breaking of a fireball at some distance from the Achaeans's camp. In any case we know that Zeus was responsible for 'thunders' of either meteorological or astronomical origin. Such a case justifies the fear of warlords and their libations to Zeus, as it is an unusual phenomenon and not a usual storm.

During the dawn of the third day (Il.8.1-2), Zeus arrived on mountain Ida's peak, in order to have a better look of the Trojan War's battlefield (Il.8.47-52). The latter has an altitude of 1774 m and is located southwards, 58 km away from Troy's plain. Zeus had his throne on the mountain's peak named Γάργαρον-Gargaron (Il. 3.276, Il.3.320, and Il.8.48). At the same day, at noon (Il. 8.66-68), when the Sun was at its higher position in the sky while crossing the local meridian (*'Ἠέλιος μέσον οὐρανὸν ἀμφιβεβήκει'-the sun had bestrode mid heaven*), Zeus *thundered* from Mount Ida and *flashed* in the battlefield. The war chiefs and all the chariots were dazzled by the brilliance of the event and run away in panic (number 4, Table 2A). Immediately, Zeus *thundered again* from Mount Ida and threw a *thunderbolt* before Diomedes' horses, which were got scared from the *fire and the odor of sulfur*. Diomedes and Nestor fled away with their chariots in terror. The description is as follows (Il. 8.75-77 and Il. 8.133-170):

'αὐτὸς δ' ἐξ Ἴδης μεγάλ' ἔκτυπε, δαιόμενον δὲ ἦκε σέλας μετὰ λαὸν Ἀχαιῶν· οἳ δὲ ἰδόντες θάμβησαν, καὶ πάντας ὑπὸ χλωρὸν δέος εἷλεν…'βροντήσας δ' ἄρα δεινὸν ἀφῆκ' ἀργῆτα κεραυνόν, κὰδ δὲ πρόσθ' ἵππων Διομήδεος ἦκε χαμᾶζε· δεινὴ δὲ φλὸξ ὦρτο θεείου καιομένοιο, τὼ δ' ἵππω δείσαντε καταπτήτην ὑπ'ὄχεσφι…. τρὶς μὲν μερμήριξε (Τυδεΐδης) κατὰ φρένα καὶ κατὰ θυμόν τρὶς δ' ἄρ' ἀπ' Ἰδαίων ὀρέων κτύπε μητίετα Ζεὺς'

'Then himself he thundered aloud from Ida, and sent a blazing flash into the army of the Achaeans; and at the sight of it they were struck with wonder and pale fear seized them all… He thundered terribly and let fly his white lightning-bolt and down before the horses of Diomedes he hurled it to earth; and a terrible flame arose of burning sulphur and the two horses seized with terror, shrank back beneath the chariot… Thrice he wavered in mind and heart and

thrice from the mountains of Ida Zeus the counselor thundered.'

This entire event had a direction toward south, with respect to the battlefield, *originating* from Mount Ida. It is known that lightning and thunderbolt occurs only during a storm. However, the scenario of a storm, occuring during the battle, must be rejected, as *it is not mentioned by Homer.* Moreover, the fresh smell in the air after a thunderstorm is caused by ozone, which is naturally created near the ground by lightnings. Lightning is also known to produce nitrogen oxides within thunderstorms. These chemicals can react with other elements in the presence of sunlight, to produce ozone (Pfister et al., 2008; Ryu and Jenkins, 2005). In our case the thunderbolt stroke in broad daylight and produced odor of sulfur within the battlefield.

Consequently, Zeus's particular thunderbolt has not a meteorolical origin. The possibility of a nearby volcanic eruption as responsible for the sulphur's odor, it is not supported from past geological studies. The last volcanic eruption in North and South Aegean Sea and at North West Asia Minor is dating back thousands of years (Cagatay et al, 2015 and Ballengee et al, 2015).

Table 2C: Homeric scenes and proposed physical events within the 5th day

number	number of day	described event/passage	proposed physical event
10a	5th day (dawn)	Participation of all the gods in battle (Il.20.20-25, Il.20.75). Ares' and Athena' mixed divine screams are heard in various parts all over the Troad (Il.20.48-53). Zeus thundered on the sky, Poseidon shook the earth, the boats and Troy's city and god Aides screams terribly.	*A fireballs' breakage occurs above the Troad. A strong earthquake accompanied by an underground's roar is occurred.*
10b	5th day	An impenetrable cloud covered Poseidon and other gods near Hercules' wall (Il.20.149-150). Also, Hera spread a thick mist near to the Xanthus' River ford (Il.21.6-7).	*A meteors' cloud with their remnants occurred in Hercules' wall and near to Xanthus' River ford.*
10c	5th day	Xanthus' river flow was blocked by many *dead bodies* and clogged the River's ford. The river's water flow flooded the plain (Il. 21.218-307). The river's waters turn red color like blood (Il.21.326).	*The earthquake changes the flowing river in front of the Xanthus' River ford caused the river's swelling. This can be happened due to landslides of slopes river and/or to deflection of water from the normal flow. As a consequence, the plain was flooded. The waters' red color is the result of the sediment's shuffling in the river's bottom and of the dead bodies'* blood.
11	5th day	Hera screamed and said to Hephaestus to manifest much flame. She said to gods Zephyrus and South to rouse from the sea a fierce blast in order to push the Hephaestus' flames in the Troad plain. The flame burned everything in the plain and heated the river's waters (Il.21.328-382).	*Dissolution of a bolide over the Aegean Sea and close to Troad's coastline. The strong southwest wind, a blast wave, pushed two flaming debris toward the plain and Xanthus River. The fragment's falling caused extensive fire.*

On the other hand, the bolides explode into the atmosphere with loud strokes and light. When a bolide remnant (meteorite) strikes on the ground could produce odor of sulfur, depending on the bolide's chemical structure (Kaplan and Hulston, 1966, Ebel, 2011). The odor of sulfur originates from ferrous sulfuric oxides, which is one of the possible components of the meteorites e.g troilite which is a rare iron sulfide mineral (FeS). Troilite is among the minerals found in samples of the meteorite that struck Chelyabinsk in Russia on February 15th, 2013 or in the Canyon Diablo meteorites, which have been found around the Barringer Crater (Meteor rim in Arizona, USA (Figure 2, top). Thus, we conclude that a bolide exploded in the atmosphere originated from Mount Ida's direction. A burning part of the exploded meteor reached in the battlefield, while the flashing and the sulfur's odor of the bolide's remnant (meteorite) caused panic in the army.

4. PHENOMENA THAT OCCURRED ON PATROCLUS' DAY OF DEATH

Poseidon was watching the battle from the peak of mountain Samos of Thrace (Il.13.10-40). That day Poseidon decided to help Achaeans; he came down from the mountain and went to Achaeans' camp (Il.13.31-33). Although his presence encourages the Achaeans in the battle, the Trojans are victorious.

Figure 2. (Top): Yellow meteorite: Canyon Diablo iron meteorite fragment (IAB) 2641 gr. (Bottom): Red meteorites: Eucrite, Polymict Breccia, Fell October 1960 Western Australia, (http://www.meteorite-times.com/Back_Links/2006/June/Meteorite_of_Month.htm).

As the Achaeans'leaders are going to ask Achilles' assistance, Poseidon roared as nine or ten thousand warriors (number 6, Table 2B). His roar was similar with Mars' roar, which was heard few days ago. It seems that a similar phenomenon as in Mars' case occurred, i.e. a new fireball broke in the atmosphere and a strong prolonged sound was heard. The description is as follows (Il.14.147-151):

'...Ὣς εἰπὼν μέγ' ἄϋσεν ἐπεσσύμενος πεδίοιο. ὅσσόν τ' ἐννεάχιλοι ἐπίαχον ἢ δεκάχιλοι ἀνέρες ἐν πολέμῳ ἔριδα ξυνάγοντες Ἄρηος, τόσσην ἐκ στήθεσφιν ὄπα κρείων ἐνοσίχθων ἦκεν.'

'…So saying, he shouted mightily as he sped over the plain. As loud as nine thousand warriors, or ten thousand, cry in battle when they join in the strife of the War god, so mighty a shout did the lord, the Shaker of Earth, send out from his breast.'

The emerged cloud with fireball's fragments was not observed over the entire battlefield; because the big meteor flied somewhere near to the Trojan plain. Indeed, almost simultaneously with *Poseidon's scream*, Hera, being 'covered' by a *kind of mist,* departed from Lemnos and Imbros islands and arrived to cape Lectum, opposite to Lesbos Island, at the foot of the Mount Ida (Figure 3). This description illustrates the fireball's breakage as it appearred over Imbros Island. The fireball's fragments are contaminated with meteoritic particles in powder-size grains (rich in iron, sulfur etc) producing a contrail along the fireball's path. They are all advected within the *atmosphere* which is *Hera's usual personification* with a direction from Imbros Island *southwards*, i.e. towards Lectum, opposite to Lesbos Island (Il.14.281-285).

'…τὼ βήτην Λήμνου τε καὶ Ἴμβρου ἄστυ λιπόντε ἠέρα ἑσσαμένω ῥίμφα πρήσσοντε κέλευθον.Ἴδην δ' ἱκέσθην πολυπίδακα μητέρα θηρῶν. Λεκτόν, ὅθι πρῶτον λιπέτην ἅλα· τὼ δ' ἐπὶ χέρσου βήτην, ἀκροτάτη δὲ ποδῶν ὕπο σείετο ὕλη.'

'…they left the cities of Lemnos and Imbros and clothed about in mist went out speeding lightly on their way. To many-fountained Ida they came, mother of wild beasts, to Lectum, where first they left the sea; and they went on the dry land and the topmost forest quivered beneath their feet.'

Wind's direction was *opposite* to the direction which fireball's fragments initially had. The Homeric text gives detailed information on this, since at that day Zeus left 'heaven' and settled himself on the mountain Ida's peak, before Poseidon's appearence in the battlefield. His arrival must be at around 10:00-10.30 in the morning because it occurred after *'the woodcutter's lunch time'* (Il.11.84-90). After that, Homer describes a *sandstorm*, originating from Ida's mountain (*southward* of Troy's battlefield) with direction toward the Achaeans camp (*north or north-west* with respect the battlefield). The sandstorm covers the Achaeans' ships with a lot of dust (*'ἐπὶ δὲ Ζεὺς τερπικέραυνος ὦρσεν ἀπ' Ἰδαίων ὀρέων ἀνέμοιο θύελλαν, ἦ ῥ' ἰθὺς νηῶν κονίην φέρεν- And Zeus who hurls the thunderbolt roused from the mountains of Ida a blast of wind that carried the dust straight against the ships'*, (Il.12.252-254)). The northward motion of the sandstorm indicates airflow towards the same direction, while the fireball's fragments moved towards the opposite direction.

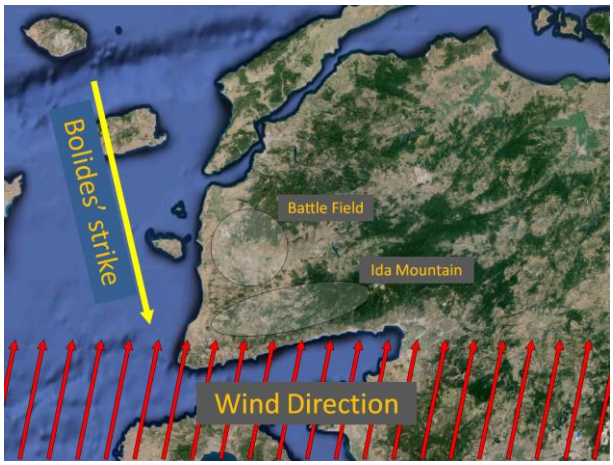

Figure 3: A bolide strikes over Imbros Island with southward direction towards Lectum (opposite to Lesbos Island). The produced particle cloud, like a mist, also moves southwards due to its initial kinetic energy. As the motion brakes down due to atmospheric friction, the southern wind takes place and directs the motion northwards. The cloud's momentum against the existing southern wind decelerates up to cape Lectum, which is located in the feet of Mount Ida, and then it turns northwards.

We note that the particle cloud, *like a mist*, moves southwards due to its initial kinetic energy. As the motion brakes down due to atmospheric friction, the already mentioned southern wind takes place and directs the motion northwards (see Figure 3). The cloud's momentum against the existing southern wind decelerates up to cape Lectum, which is located on the feet of Mount Ida, and then it turns northwards. The mist which includes the bolide's remnants, after the turning, appears as a 'gold cloud' (Il.14.343-345) on Ida's mountain peak.

According to the text, goddess Hera is decided to '*mislead*' Zeus in order to help Poseidon. From this reason Hera from mount Olympus arrived in Lemnos and together with god Hypnus departed from Lemnos and Imbros islands to Mount Ida's peak (Gargaron). Hera met Zeus who asked her to be '*bedded in love*'. The goddess was willing but she was afraid that everybody could see them, on the mountain's peak: *Ἴδης ἐν κορυφῇσι, τὰ δὲ προπέφανται ἅπαντα*'-'*on the peaks of Ida and everything is plain to view*' (Il.14.332). Then Zeus covered the mountain peak with a 'thick golden cloud' (Il.14.343-345):

'*…τοῖόν τοι ἐγὼ νέφος ἀμφικαλύψω χρύσεον· οὐδ' ἂν νῶϊ διαδράκοι Ἠέλιός περ, οὗ τε καὶ ὀξύτατον πέλεται φάος εἰσοράασθαι*.'

'*…With such a cloud shall I enfold you, a cloud of gold. Through it not even Helios could discern us, though his sight is the keenest of all for seeing.*'

The official English interpreter gives the impression to the reader, that Zeus covered only Hera and himself with the cloud by saying '*shall I enfold you*'. However, in some phrases earlier in the text (Il.14.332), Hera clearly says that the *peaks* of Ida Mountain are *visible* to everybody and not *only herself* in particular. Consequently Zeus responding to Hera's request covered from *all possible* sides the mountain's peak. This is exactly the meaning of the verb '*ἀμφικαλύπτω*' and not '*enfold*'. The word's power '*ἀμφι*' means that every side on the mountain's peak has the *same property* as its corresponding antidiametric side. In other words the entire mountain peak is fully covered and hence is invisible from all directions. The initial mist, originating from Imbros Island, reached Mount Idas' peak. It is the fireball's remnants which were driven by the air. The cloud's thickness was such that, it did not allow the sun's rays to penetrate it. It fully covered the peak and got a *golden (yellow) color*. The color depends on the chemical composition of the fireball. We note that the meteorite *on the ground* of another fireball had an odor of sulfur (see section 2). The latter had also a characteristic yellow color.

We mention to the reader that Homer characterizes Mount Ida having many fountains (Il.14.307 '*πολυπίδακος Ἴδης*'). In the text the word spring ('*πηγή*'), which means simply flowing water from the ground, is not used. On the contrary the word many fountains ('*πίδακες*') from which water were ejected from the ground upwards is used. It is understandable that when water is ejected upwards due to pressure, as the fountain does, it comes back to the ground like glistering dew drops, as exactly it is described in the text (Il.14.350-351):

' *…ἐπὶ δὲ νεφέλην ἕσσαντο καλὴν χρυσείην· στιλπναὶ δ' ἀπέπιπτον ἔερσαι.*'

'*…and were clothed about with a cloud, fair and golden, from which fell drops of glistering dew.*'

We also note that this particular mountain peak is called 'Gargaron' whose name means gurgling water, even in modern Greek grammar.

Moreover, the above mentioned golden thick cloud had *a pleasant smell* according to the text ('*ἀμφί δε θυόεν νέφος ἐστεφάνωτο- and about him (Zeus) a fragrant cloud was wreathed*', (Il.15.153)). Even if we accept that the chemical composition of the fireball was iron sulphide, it did not retain the sulfur's odor because of the prevailing conditions on Ida's mountain peak, in which the following plants existed: grass, lotus, crocus and hyacinth (Il.14.347-349). The combination of the odors of these fresh plants in a watery environment due to the existence there, of many *nature made fountains*.

Later, as the Achaeans are fighting close to their ships, against the advancing and victorious Trojans, Nestor *prayed* to Zeus and the latter *responded* with a *thunder* originating, once more, from Ida Mountain ('*μέγα δ' ἔκτυπε μητίετα Ζεὺς…- Zeus the counselor thundered aloud*', (Il.15.377-380)). The clouds covered fully the mountain's peak, they are dense and golden, and offer a pleasant smell. From *these* properties we conclude that they are not stormy clouds (number 7, Table 2A). Although Homer describes a very hot day, these particular clouds do not fit with the *cumulonimbus cloud*s. These are associated with *thermal thunderstorms*, expected in the hot hours of the day, following intense heating at the ground (Metaxas et al. 1999, Nastos et al. 2002, Nastos et al. 2014). In addition, there wasn't any reference for *lightening*. If this '*thunder*' was connected with a meteorological phenomenon, there should have been a preceeding lightening which is exhibited *always* before the thunder. Consequently, the above mentioned Zeus' thunder is one more meteoric phenomenon (fireball's breakage).

During the afternoon hours of the same day, the Achaeans retreated *near their ships* hunted down by the Trojans. The Sun was still well above the horizon, while Achilles was going to the trench, in order to be seen and scare the Trojans (Il.18. 197-201). In this Homeric battle scene, Achilles has already passed *the trench* and he was on the *defense wall's top*,

having the ships in his front and the plain in his back, (Il.18.148-150 and Il.18.198). Another *thick golden cloud* and a big fire with *bright flame reaching the sky* were visible from the direction of Troy's plain, on Achilles' back (number 9, Table 2B). The phenomenon was accompanied by *strong sounds* personalized as Achilles' *terrible screams*. The flame and the strong sounds are poetically associated with goddess Athena and Achilles (Il.18.203-229) too.

'…ἀμφὶ δ' Ἀθήνη ὤμοις ἰφθίμοισι βάλ' αἰγίδα θυσσανόεσσαν, ἀμφὶ δέ οἱ κεφαλῇ νέφος ἔστεφε δῖα θεάων χρύσεον, ἐκ δ' αὐτοῦ δαῖε φλόγα παμφανόωσαν… ὣς ἀπ' Ἀχιλλῆος κεφαλῆς σέλας αἰθέρ' ἵκανε. στῆ δ' ἐπὶ τάφρου ἰὼν ἀπὸ τείχεος….ἔνθα στὰς ἤϋσ', ἀπάτερθε δὲ Παλλὰς Ἀθήνη φθέγξατ' ἀτὰρ Τρώεσσιν ἐν ἄσπετον ὦρσε κυδοιμόν…. ἀτὰρ καλλίτριχες ἵπποι ἂψ ὄχεα τρόπεον· ὄσσοντο γὰρ ἄλγεα θυμῷ. ἡνίοχοι δ' ἔκπληγεν, ἐπεὶ ἴδον ἀκάματον πῦρ δεινὸν ὑπὲρ κεφαλῆς μεγαθύμου Πηλεΐωνος δαιόμενον· τὸ δὲ δαῖε θεὰ γλαυκῶπις Ἀθήνη.'

'…and around his mighty shoulders Athene flung her tasseled aegis, and around his head the fair goddess set thick a golden cloud, and from the man made blaze a gleaming flame. …so from the head of Achilles went up the gleam toward heaven….There he stood and shouted and from afar Pallas Athene called out, but among the Trojans he roused unspeakable confusion….And the fair-maned horses turned their chariots backward, since they saw woe in their hearts. And the charioteers were stricken with terror when they saw the unwearied fire blaze terribly above the head of the great-hearted son of Peleus; for the goddess flasing-eyed Athene made it blaze.'

The scene describes a flaming fireball, which broke loud and a meteorite's piece fell on the ground, close to inflammable materials and caused fire. The remnants *as a golden (yellow) cloud* appeared over Achilles' head *in projection*. The common properties of the early clouds in comparison with this scene, as well as the yellow color on Ida Mountain's peak, imply the common chemical composition and origin of all these fireballs. Moreover, this particular cloud's appearance had an effect in the sky (Il.18.239-241): '*Ἥλιον δ' ακάμαντα βοώπις πότνια Ηρη πέμψεν επ' Ωκεανοίο ροάς αέκοντα νέεσθαι. Ηέλιος μεν έδυ-Then was the unwearyingly Sun sent by ox-eyed queenly Hera to return, unwilling, to the stream of Ocean. So the sun set*'. The thick dust cloud, transported by the air (Hera), covered the sunlight and it gave the impression that the sunset occurred *earlier* than his normal time.

5. RED DROPLETS AND A RED CLOUD

Zeus *at dawn* of the forth day (Il.11.1-14 and Il.11.50) sends Mars' sister and comrade, Eris (Strife), to the Achaeans' ships. Eris was extended up from the sky down to earth (*'ἦ τ' ὀλίγη μὲν πρῶτα κορύσσεται, αὐτὰρ ἔπειτα οὐρανῷ ἐστήριξε κάρη καὶ ἐπὶ χθονὶ βαίνει -'She first rears her crest only a little, but then her head is fixed in the heavens while her feet tread on earth'*, (Il.4.439-445)). She had in her hands '*πολέμοιο τέρας (a portent of war)*', standing between the ships and screaming loudly (*'ἤϋσε θεὰ μέγα τε δεινόντε ὄρθι - she uttered a great and terrible shout a shrill cry of war'*. Eris' voice was heard in the entire Achaeans' campus and their ships. In other words, a terrible scream was heard from one edge of the battle field all the way to the other, accompanied with a war's celestial symbol (*'τέρας'*). The warriors heard the scream, awakened suddenly and they began to prepare for the war (number 5a in Table 2A). Then, goddesses Athena and Hera (Il.11.45-46) honored Agamemnon, King of Mycenae, with a big stroke (*'γδούπος'*), like a body falling on the ground (Il.11.45-46):

'…ἐπὶ δ' ἐγδούπησαν Ἀθηναίη τε καὶ Ἥρη τιμῶσαι βασιλῆα πολυχρύσοιο Μυκήνης…'

'…Athene and Hera thundered, doing honor to the king of Mycenae…'

The interpreter describes the word '*εγδούπησαν*' which means '*hit the ground*' as '*thundered*'. This is not correct, however, because the thunder is associated with a meteorological phenomenon and not with the sound of falling body on the ground. The Homeric passage seems to describe the appearance of a bolide in the sky (*'πολέμοιο τέρας'*), giving details about its trajectory (*Eris extended between sky and earth*), its explosion (*Eris' scream*) as a celestial and loud phenomenon. A large part of this bolide fell on the ground with a strong sound (*'γδούπος'*). The warriors did not see any lighting coming from the bolide, since they were sleeping in their tents and woke up abruptly, exactly to this strong sound.

Simultaneously, Zeus caused a '*bad disruption*' in the air and '*blood' droplets* from the sky fell on the ground, as an omen of many men's death (Il.11.52-55):

'…ἐν δὲ κυδοιμὸν ὦρσε κακὸν Κρονίδης, κατὰ δ' ὑψόθεν ἦκεν ἐέρσας αἵματι μυδαλέας ἐξ αἰθέρος…'

'…The son of Cronos roused an evil din and down from on high out of heaven he sent dew drops dank with blood…'

We consider that this atmospheric disruption can be produced by the dissipation of the soil's dust and the bolide's fragments, due to a creation of an impact crater, with high velocity upwards in the atmosphere.

Another explanation of this '*bad disruption*' could be a dust devil (tornado). However, studies on tornadoes over the wider area of Greece (Nastos and Matsangouras 2010, Matsangouras et al. 2014, Nastos and Matsangouras 2014) have revealed that, on one hand, tornado's monthly variability depicts a maximum during automn and on the other hand, tornadoes are pre-frontal extreme phenomena (thunderstorm). There is no report of a nearby thunderstorm

mentioned by Homer. Also the described extremely warm weather conditions do not fit with the autumn climatic conditions, in which one expects high propability of tornado's occurrence. Moreover, tornadoes most commonly develop during the warm time of the day, as more than 75% of all cases occur during 08:00–15:00 hours UTC with a maximum at 12:00 hours UTC. Following Homer's description this atmospheric phenomenon occured early in the morning. Consequently *Zeus' air disruption* can not be explained or compared with a tornado.

Another approach is to think that a *Saharan red dust cloud* was transported to the North East Aegean Sea and fell as the dawn's moisture (*'blood'droplets)*. Such a hypothesis, although attractive, is also rejected because the Saharan episodes are common in East Meditteranian Sea during late winter and *very* early spring. They occur when strong southern air mass flows towards north direction and is adverted from Saharan regions towards the Aegean Sea (Barkan et al. 2005, Antoine and Nobileau 2006, Kaskaoutis et al. 2008, Nastos 2012). The duration of these dust events is usually 1-2 days, since the depressions favoring them, while they move quickly and attenuated. Specifically, during spring, the *Sharav* cyclones carry Saharan dust towards the Eastern Mediterranean, while in summer the most intense activity occurs in the central part. By the end of summer a low pressure system over the Balearic Islands drives the dust plumes towards the Western Mediterranean (Meloni et al. 2007). On the other hand, Saharan episodes are associated with an *extensive cloudiness* that covers a whole area over Eastern Mediterranean. This is generated by the presence of the depression and the uplift of water vapor from the sea. Such a southern air flow associated with cloudy weather is not documented in the Iliad. Instead, the description fits well with sunny days and heatwave conditions. Also, a Saharan episode is not associated with any atmospheric disturbance, as the described Zeus' *atmospheric disruption*.

An alternative scenario could be that the '*blood' droplets* could be caused by ash's red constituents from a possible nearby volcanic eruption. However, we know from detailed geological studies in Greece and in Asia Minor that there is not any near or distant volcanic activity during the 12th and/or the 13th century B.C. since no ash deposit has been ever found in drilled cores collected in either the Hellespont, Black Sea or in the Troad itself, in this time period. Consequently, we conclude that the *'blood'droplets* do not have a volcanic origin.

Another interpretation of the *red* drops phenomenon is that it could be caused by the Haematococcus Pluvialis, unicellular green algae which produces astaxanthin, a type of *red* pigment ketocarotenoide, with major antioxidant properties. This kind of algae has a complex life cycle changing several cell forms, depending on the environmental conditions (Elliot, 1934). Under environmental stress, it appears morphological cell changes, characterized by *red* color, reaching the ground as *red* droplets, in case of a rain episode (Guerin et al., 2003; Guerrero et al., 1999). The geographical distribution of *Haema*tococcus Pluvialis is widespread, since it appears in wetlands of North America and the coasts of European Atlantic Ocean, while it is worth noting its absence over the wider area of Mediterranean (Martinez-Silva, 2011). A recent paper by Fernández-Lozano et al. 2015 analyzes a rare *red rain* event in Spain during autumn 2014. The authors came to the conclusion that *Haema*tococcus Pluvialis was transferred by strong western winds blowing over Iberian Peninsula from the Atlantic Ocean, since there is not any sign of Pluvialis in the nearby lakes the day after the rain event. Taking into consideration the aforementioned assumption, the case of *red rain droplets* caused by *Haema*tococcus Pluvialis should be excluded, since, to the best of our knowledge, it has not ever been reported in the Eastern Mediterranean.

We have rejected all other possible exlpanations for the *'blood droplets* and we have pointed out that the bolide's explosion is poetically described as the Eris' appearence and scream, while Athena and Hera hit the ground. We conclude that the *'blood' droplets'* are connected with the bolide's explosion with the following mechanism: At dawn, a big bolide intersected the atmosphere with a terrible sound *('Eris' scream'*) and impacted on the ground *('ἐπὶ δ' ἐγδούπησαν Ἀθηναίη τε καὶ Ἥρη - Athene and Hera thundered')*, producing a crater from which the soil and the fragments of the bolide were ejected upwards (*'εν δε κυδοιμόν ὡρσε κακόν Κρονίδης- The son of Cronos roused an evil din'*). Powder-like grains, produced by the remnants of the bolide's explosion, can act as condensation nuclei. The increased humidity during dawn, as well as the event's proximity to the sea, combined with the pre-existing condensation nuclei, could result in *'blood'droplet's* precipitation. The red color of the droplets is characteristic for the iron-oxides and their chemical compounds (e.g. *haematite*) and clay's minerals, which are consisted a common chemical composition of the meteors (Figure 2b, bottom). In addition, *red-colored nitrogen oxides* can be produced, as the bolide causes chemical reaction between the existing elements.

In addition to the morning's events which were analysed above, new similar events are presented later, during the solar eclipse's manifestation. In an earlier paper, Papamarinopoulos et al. (2014), have presented analytically the solar eclipse's occurrence and progression (solar eclipse's start time is 14:10

LT). At *noon* (Il.16.777-780), when Patroclus engaged in fighting with Sarpedon (5b, Table 2B), Zeus sprinkled the battlefield with '*blood' droplets* (Il.16.459):

'αἱματοέσσας δὲ ψιάδας κατέχευεν ἔραζε'

'he shed bloody rain drops on the earth'

Earlier in our text, we had interpreted the dawn's fall of '*blood' droplets* as a result of a high humidity. But now, the fall of '*blood' droplets* happened during *hot atmospheric conditions at noon* (Il.10.572-575, Il.11.621-622, Il.11.642-643, Il.11.811-812, Il.12.385-388). It is known that a sudden decrease in the atmospheric temperature occurs during a solar eclipse. As a consequence of *temperature drop*, *humidity rises*, as shown in Figure 4. These conditions, in combination, most likely interpret the '*blood' droplets*, due to condensation process on the *red grains* that have remained in the atmosphere, due to the bolide's explosion in early morning. The lack of a blowing wind allowed the morning's *red grains* to remain in the atmosphere. Thus, these *red droplets* have the same explanation as the early morning's ones, under the extreme conditions of the solar eclipse. Figure 5 presents a simulated representation of the atmospheric conditions during the partial solar eclipse (with a magnitude of 75%) of 6th of June 1218 B.C. (see Papamarinopoulos et al, 2014), as it could be observed from the wider area of Troy. The diagram utilizes measurements similar to those in Figure 4, but decreased by a factor of 75% and adjusted accordingly for afternoon hours, in order to mimic atmospheric changes during the partial eclipse in Troy. This Homeric scene following by a reference of a 'kind of darkness' at noon, after Sarpedon's dead (Il.16.567-568), fits well with the time period between 14.30-14.45 LT of Figure 5.

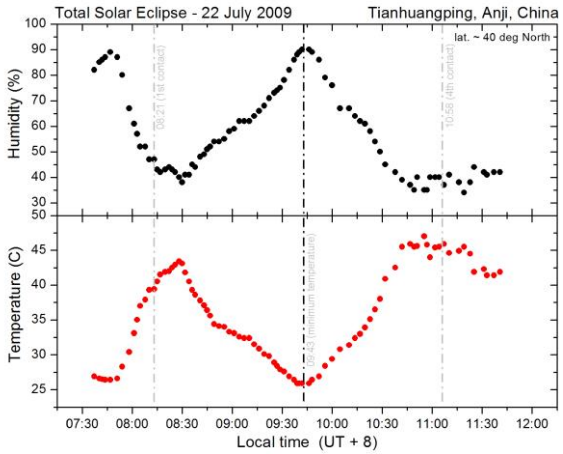

Figure 4. Local atmospheric conditions change during a solar eclipse, as the upper atmosphere cools down and this is transferred gradually on the ground. In parallel, humidity rises as a consequence of temperature drop. The diagram above shows actual measurements during the total solar eclipse, which occured on 22 July 2009 in Tianhuangping, China (from K. Gazeas' observation).

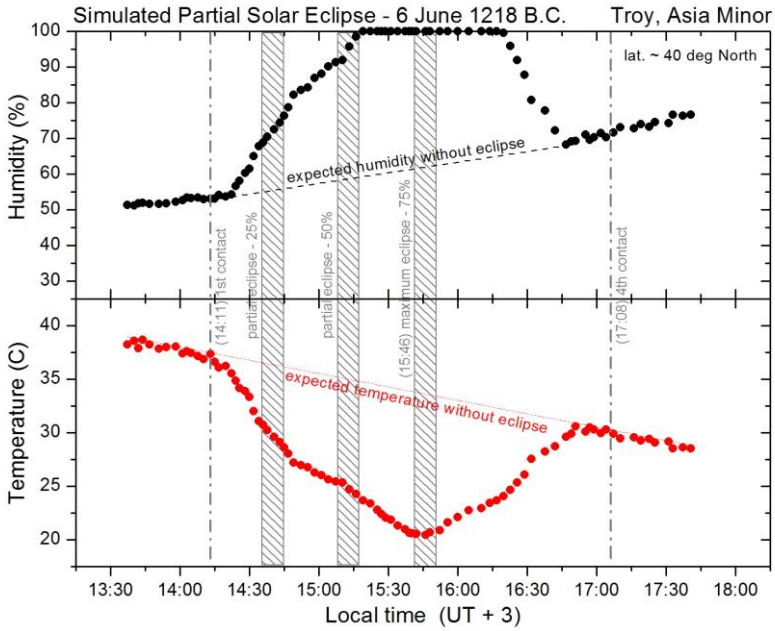

Figure 5. The diagram shows a simulated representation of the atmospheric conditions in the area of Troy during 6 June 1218 B.C., using as a guide the actual measurements from Figure 4 but decreased by a factor of 75%. In addition the actual values are multiplied by an additional factor which represents the temperature drop as the daylight deminishes and temperature drops during evening times. When 25% of the solar disk is covered one may notice a temperature drop but it is very rare. Usually human senses detect temperature drop when 50% of the solar disk is covered. This is connected with illumination changes, which start being obvious in the environment even for an unaided eye. For the next 30 minutes the eclipse moves from 50% to 75% when the temperature drops significantly and humidity rises to maximum.

After the fall of the '*blood' droplets'*, Hector and Patroclus got engaged in fighting (Il.16.760-761) and Patroclus was killed by Hector (Il.16.786-810). According to the description about the solar location (Il.16.777-780), it is indicated that the time has been advanced toward *late noon.* Then, Achaeans and Trojans began fighting around the dead Patroclus' body and 'another kind of darkness' at noon is described by the Homeric text (Il.17.269-270, see also Il.17.366-376). The scene fits well with the time around 15:15-15:30 LT, according to Figure 5. While they continue to fight, in order to obtain Patroclus' dead body, Zeus sends Athena like a *red cloud* (5c, Table 2B) in the battle field (Il.17.543-552):

'…ὣς ἡ πορφυρέη νεφέλη πυκάσασα ἑ αὐτὴν δύσετ' Ἀχαιῶν ἔθνος, ἔγειρε δὲ φῶτα ἕκαστον'

'…so Athene wrapping herself in a dark-shimmerring cloud entered the throng of the Danaans and roused each man.'

This *deep red cloud* (personalized by Athena) did not stay in the sky but it *landed* on the battlefield between the fighters. We note that the interpreter did not pay attention to the word *'πορφυρέη- porphyra'* which in Greek means *deep red*. He does not characterize the cloud as *deep red*, but as 'dark shimmering cloud'!

The red cloud could be produced by the *red grains* (*'blood' droplets*), which remained in the atmosphere since early morning, acting as condensation cores. The existence of these grains in the atmosphere in combination with the steep humidity rise and temperature drop, due to the solar eclipse, produced a deep red cloud, which fell over the battlefield, giving the impression of a *mist.*

We mension that, just a little earlier, *there is not a single cloud* either on the plain or on the mountains (*'νέφος δ' οὐ φαίνετο πάσης γαίης οὐδ' ὀρέων'-on all the earth and the mountains was no cloud seen'),* according to the Homeric text (Il.17.366-376). Almost simultaneously with the *red cloud's falling* on the battlefield, Zeus who was always on Mount Ida's peak, *fully covered* the mountain with clouds (number 8,Table 2B) and *lightened and thundered*: *'Ἴδην δὲ κατὰ νεφέεσσι κάλυψεν, ἀστράψας δὲ μάλα μεγάλ' ἔκτυπε -enfolded Ida with clouds and lightened and thundered mightily',* (Il.17.594-596). It seems that the mist spread over a large area and all the Mount Ida covered by the haze. One more bolide's explosion directed from the Mount Ida has occurred.

A few minutes later, being close to the solar eclipse's maximum phase, Ajax shouts in agony that it is impossible to see anything (Il.17.643-647). Ajax's *complete divisibility* is explained due to the *combination* of the red cloud's landing in the battlefield just minutes earlier than the eclipse's peak (~15:40 LT, see Figure 6) and the resulted significant darkening of the eclipse itself at 15:45 LT (solar disk's obscuration of 75%) according to Papamarinopoulos et al. (2014). The divisibility period lasted only for a few minutes, because immediately Zeus (Il.17.648-650):

'…αὐτίκα δ' ἠέρα μὲν σκέδασεν καὶ ἀπῶσεν ὀμίχλην, ἠέλιος δ' ἐπέλαμψε'

'…immediately scattered the darkness and drove away the mist and the sun shone on them'

Zeus acted *twice* at that time; he scattered the *darkness* and drove the *mist*. In other words, the *two different phenomena* which in combination produced the complete divisibility-the *solar eclipse's effect* and the *red cloud-haze*-were completely vanished. Then, *'ἠέλιος δ' ἐπέλαμψε'-the sun shone'*. The Sun're-shone' is used and not simply 'shone', because the verb 'to shine' means *'λάμπω'*, whereas the Homeric verb *ἐπιλάμπω'* meaning that the Sun did not shine for some time and then it *shone again*.

6. SEISMIC ACTIVITY

In Section 4, we refer to the Homeric description (Il.13.17-19) about Poseidon, who came from Thrace, while the mountains and the woods were trembling beneath his feet and he arrived to the Troad (*'τρέμε δ' οὔρεα μακρὰ καὶ ὕλη ποσσὶν ὑπ' ἀθανάτοισι Ποσειδάωνος ἰόντος - And the high mountains and the woodland trembled beneath the immortal feet of Poseidon as he went)*. In addition, when Hera and Hypnus arrived in Cape Lectum, opposite to Lesbos Island, the woods were trembling too under their feet (*'Τὼ δ' ἐπὶ χέρσου βήτην, ἀκροτάτη δὲ ποδῶν ὕπο σείετο - and they went on the dry land and the topmost forest quivered beneath their feet'* (Il.14. 281-285)). These two phenomena occurring sequentially in the same morning, with a relatively short interval between them, could be interpreted as two distinct geophysical events, which seem to have local earthquake's characteristics. They are distributed along Asia Minor's west side towards the Aegean Sea. Almost simultaneously, the sea's level rise reached the Achaeans' ships and tents (*'ἐκλύσθη δὲ θάλασσα ποτὶ κλισίας τε νέας τε Ἀργείων -the sea surged up to the huts and ships of the Argives',* (Il.14.392-393)). This activity, in connection with the two seismic events, is similar with a small tsunami's performance. The entire presented information indicates a sub-marine epicentre with a shallow depth. We note that all three places, which are connected with tremors, located on the well known active North Anatolian Active Fault System (Figure 6).

The next day, after Patroclus' death, early in the morning, terrible screams by Athena and Mars are heard in all Troy's plain (number 10a, Table 2C). Simultaneously, a terrible strong thunder from Zeus (*'δεινόν δε ἐβρόντησε… ὑψόθεν' - terribly thundered… from on height*) was heard and an earthquake pro-

duced by Poseidon was felt (*'Ποσειδάων ἐτίναξε γαιαν ἀπειρισίην - Poseidon caused the vast earth to quake'*). Mountains, the plain, Troy's city, the Achaeans ships were all shaken severely (Il.20.45-65). Even Hades screamed *('he leapt from his throne and cried aloud'- δείσας δέ εκ θρόνου ἆλτο καὶ ἴαχε')* from his underground palace, being scared that the ground will open from above, due to the intense earthquake. We should mention again that just in the previous day, two more weak seismic events accompanied by tsunami waves were also occurred. During this day, almost 24 hours after the first two weak earthquakes, a very strong earthquake was felt throught-out the plain, from the Hellespont to Ida Mountain.

Trifonov (2010) indicated that in Troy VI layer's walls, there was evidence of a seismic damage (Figure 7). The existence of seismic activity does not mean necessarily that these seismic events correspond to the seismic event decribed by Homer. The high seismicity of the entire region is compatible with traces of seismic events, recorded in various Troy's layers, which have occurred in various time periods.

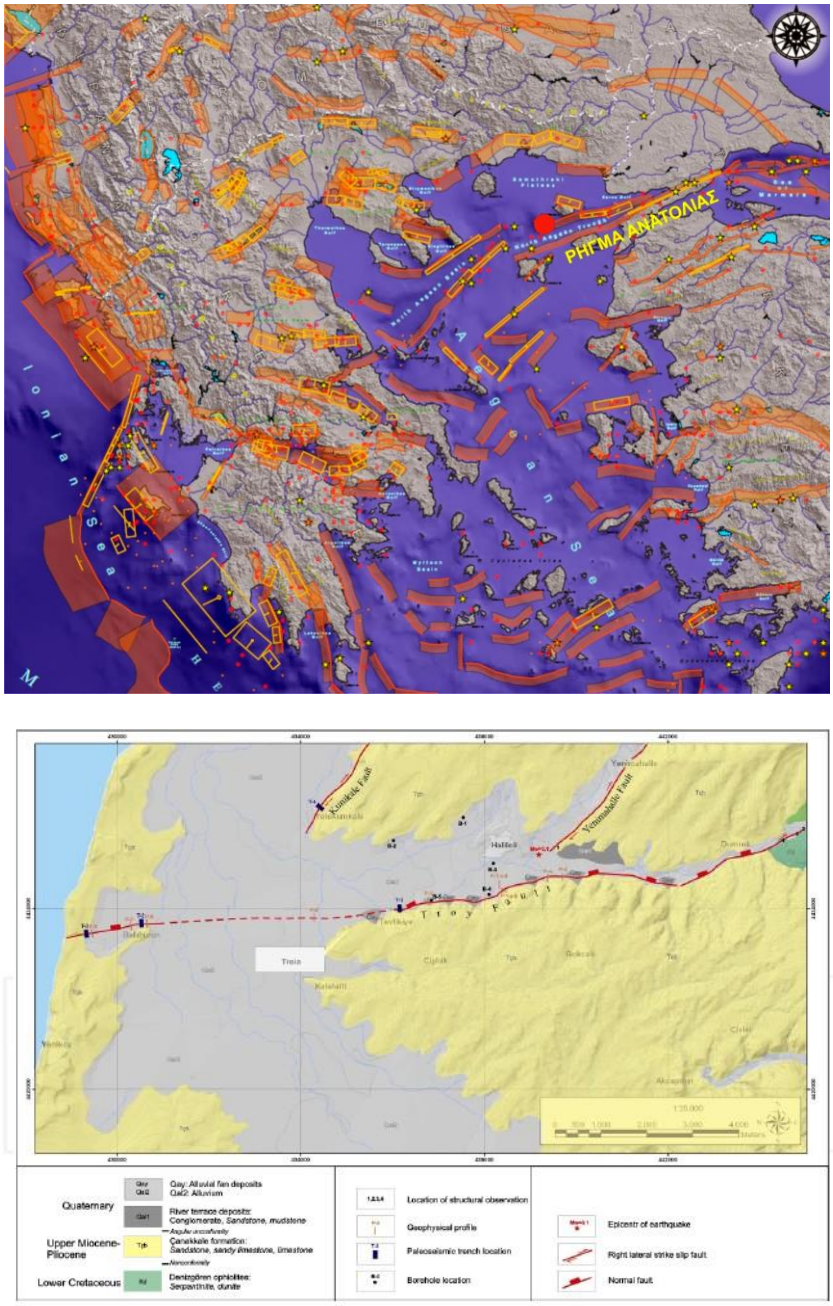

Figure 6. a) The gridded map of the geological faults in the wider Aegean area. (Papanikolaou, I.D. and Papanikolaou, D.I. (2007). Seismic hazard scenarios from the longest geologically constrained active fault of the Aegean. Quaternary International 171-172, 31-44. b) Troy's fault is passing through Troy's site. It is an extract from the paper published by Kurcer et al (2012).

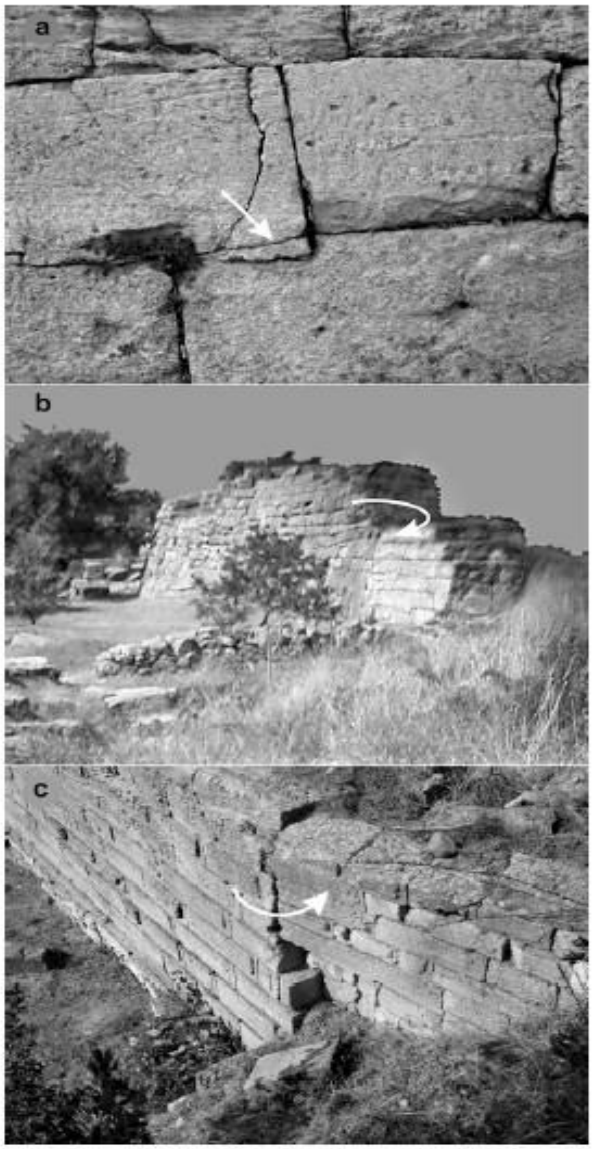

Figure 7: a. Break in anti-seismic constructions in the eastern part of Troy's VI walls constructed by 'Poseidon' himself during Laomedon's kingship (Troy VIh layer) in accordance to Iliad and the Greek mythology. b. The clockwise rotation of the Palace VIM (southern part of Troy's VI layer. c. The counter clockwise rotation of the wall in the Roman epoch (southwestern part of the Troy IX layer). The two seismic rotational motions in clock and anticlockwise directions of adjacent constructions of Troy's VI and IX layers respectively demonstrate deformations by different seismic events, (after Trifonov, 2010).

Kurcer et al. (2012) attempted to interprete the visible seismic damages in Troy's walls shown in Figure 7 carrying out extensive field work on the so called 12 km Troy fault (Figure 6). The team's rational is based on palaeoseismic evidences, *excavated* along the Troy fault, passing through *ancient* Trojan territory, and also in C-14 datings carried out on samples from chronological datings taken from drillings at different depths from Troy's fault too. They concluded that the visible damages, on Trojan walls are not due to *ground differential motion* but they are due to past seismic events originating from different faults and *not from the main Troy fault itself*. The authors followed the formula introduced by Pavlides and Caputo, (2004), concluded also that the so called Troy fault is not responsible for any seismic activity until 1190 B.C. They attributed the damages in Trojan walls in other active faults, in Biga Peninsula or/and from Gaziköy-Saroz regions which represent the north branch of North Anatolian Fault System.

As they admit in their research, they could not reach a bigger depth in the Tevfikiye trench due to the found by them free water horizon. If they had reached some meters or so deeper than the depth, which they have stopped, they *might have found* evidence of an earthquake which had occurred on the Trojan layer VIh, and/or the 'Homeric' earthquake occured one or two months before Troy's conquest, which occured in 1218 B.C. according to Papamarinopoulos et al. (2014).

Exactly due to the high seismicity of this region, in accordance with the Greek mythology and the Iliad as well, the strong walls of (layer VIh) Troy's Acropolis that withstand the strong earthquakes were built *so strongly* by *'Poseidon'* himself *during Laomedon's kingship*. The resistance to earthquakes of these Acropolis' walls, of course need an 'engineer' as capable as 'Poseidon', the so called in Iliad 'ενοσίχθων'-κοσμοσείστης (the world's shaker), since 'Poseidon' was the god of the earthquakes and of the waters too.

This strong earthquake which deformed the constructions of Troy VIh layer is dated *after* 1300 B.C. (Troy VIa-VIh, c.1700-1250 B.C., (Fields, 2004)), in accordance to the archaeological studies. No human remains have been found in the debris produced by this earthquake. It seems that people left in time without taking away their belongings and the same people came back and rebuild the city using the debris produced by the previously mentioned earthquake. They rebuild it fastly and careslessly, placing the new buildings within the Acropolis, with dense stucture.

Probably they did, under military threat. This new 'rebuild' city is Troy VIIa layer. From the conducted studies, there is no cultural void between Troy VIIa and VIh layers, because the found objects are similar. Troy VIIa layer extends over a small period, maybe within one human generation (~30 years). It is totally destroyed by fire and it is replaced by Troy VIIb layers (Troy VIIa-VIIb2, c.1250-1050 B.C., (Fields, 2004)).

Blegen (1963) indicated that Troy VIIa layer is the Homeric Troy, because the archaeological findings led to a regime under emergency, maybe even under siege. The fact that other supporting findings of

the siege have not been found is due to the complete destruction of the layer VIIa by the builders of the layer VIIb. Further destructions of VIIa and VIIb have occurred by the new successive building activities, from that period until the Roman times. One needs to add that further catastrophes have occurred in VIIa and VIIb layers by Schliemann and other excavators, because architectural remains were removed and the recording of the obtained data did not follow the typical modern procedures. This has as the consequence that some findings got lost for ever and some others produced confusion.

In accordance with the Greek mythology before the *known* Homeric *Trojan War* against the Trojan King Priamus, there was another war, conducted by Hercules and the fathers of the heroes of the *known Trojan War* against the Trojan King Laomedon, who was Priamus' father. *Young Priamus* was witnessed the first Trojan War and became Troy's King, as Laomedon's successor. The latter has been killed by Hercules. The second *known* (Homeric) Trojan War had the Achaean King Agamemnon of Mycenes and the *old now Trojan King Priamus* as leaders of the Greeks and the Trojans respectively. It seems that after the first Trojan War, there was always the military threat of a second war and this was the cause of the fast and careless, dense structure building, *within the Acropolis,* after the earthquake which destroyed Troy VIh layer.

We mentioned earlier in the text that the strong Trojan (layer VIh) walls were built by *'Poseidon'* himself *during Laomedon's kingship.* However, Laomedon refused to pay and Poseidon sent a monster to do damages on the plain, according to the Greek mythology. Hercules killed this monster, but again Laomedon refused to pay. This was the reason of the first Trojan War. Consequently, the strong *Troy VIh* was the *layer corresponding* with the *Laomedon's Kingdom*. We also note that the Troy VIh layer presents *earthquake's destruction* and the successive, culturally similar, *Troy VIIa layer presents fire's destruction*. This evidence is in accordance with the second (Homeric) Trojan conquest, in which the *Acheans burned the city*. The Troy VIIa was the Priamus's Kingdom. The Homeric descriptions of seismic activity took place one or two months before Troy's second fall.

7. PHENOMENA OF THE NEXT DAY AFTER PATROCLUS' DEATH DAY

The next day, after Patroclus' death, starts with terrible screams by Athena and Mars, a terrible strong Zeus' thunder and an intense earthquake, produced by Poseidon (see previous section). After these events, Poseidon, Hera and the other gods withdrawn in Hercules' wall (Il.20.149-150) and they covered themselves by an opaque cloud (*'ἄρρηκτον νεφέλην'- impenetrable cloud*). Hercules' defensive antiflood wall was situated close to Hellespont, against the Poseidon's monster (see the previous section). It was protecting Troy's plain, as it was at that time period. We interpret these phenomena as a *bolide's explosion* which occured in some distance from the Troad. It is known that the sound of the Tunguska bolide's explosion, in 1908, was heard at a distance of 800 km from the epicenter of the event, without seeing any light (Rubtsov, 2009). Also, in the Homeric text no light is described during this explosion. Its fragments and powder-sized grains (number 10b, Table 2C) caused the appearence of an opaque cloud.

After the strong earthquake's occurrence and during the battle's progress, Achilles has pushed the Trojans near to the ford (*'πόρος'*) of Xanthus River (Il.21.1). Part of the Trojan army is within the river, whereas the rest of the army retreats to the plain toward the city. At that moment *'Hera spread before them (the retreating part) a thick mist to hinder them'- 'ἠέρα δ' Ἥρη πίτνα πρόσθε βαθεῖαν ἐρυκέμεν',* (Il.21.6-7). This thick mist is a second appearance of the cloud's remnant produced by the previously mentioned bolide's breakage which was transferred by the *atmospheric air* (*personalized by Hera*) to the plain (number 10b, Table 2C). Achilles is now in combat with the Trojans in Xanthos River's waters *at the ford,* while he had killed several enemies. According to the text, the dead bodies were so many that they obstructed the river's flow towards the Hellespont (Il.21.213-221). As a consequence, the river's waters flood the plain, pushing dead bodies outwards. The turbulent waves reached Achilles, who was trying to run within the flooded plain (Il.21.234-300). The water's impetus and quantity is quite large and Achilles' life is in danger (number 10c, Table 2C). The *ford (*'*πόρος*'*)* was positioned northwest to Troy's city, near to Ilus' tomb (Il.14.433, Il.21.1, Il.24.349-351, and Il.24.692-693). Obviously, the river narrows in this area, which was near Troy, serving as the passage from and towards the city. Probably, the strong earthquake rearranged the river's path, by inducing landslides in its slopes. The latter in combination with the existence of many dead bodies in the river's ford blocked the river's flow in that narrow passage, resulting in flooding of the plain.

Then the text describes that river *Xanthus*, whose name means *blond*, changes his color into deep red (*'πορφυρέον'*), while it is still flooding and rushing. The interpreter *again* misses entirely the waters' redness by saying simply 'dark flood'! The waters' red color is attributed by Homer to the bodies' blood (Il.21.324-327):

'…Ἦ καὶ ἐπῶρτ' Ἀχιλῆϊ κυκώμενος ὑψόσε θύων μορμύρων ἀφρῷ τε καὶ αἵματι καὶ νεκύεσσι. πορφύρεον δ' ἄρα κῦμα διιπετέος ποταμοῖο ἵστατ' ἀειρόμενον, κατὰ δ' ᾖρεε Πηλεΐωνα'.

'…he spoke and rushed tumultuously on Achilles raging on high and seething with foam and blood and corpses. And the dark flood of the heaven-fed river rose towering above him and was about to overwhelm the son of Peleus.'

The red color may be caused by stirring of sendiments of the river's bed together with what fell from the slopes and the blood of dead bodies as well. However, after a short time, the strong water's flow cleared and the normal flow of the river restored. Homer's notification that the event will last temporarily is given as information to Achilles by the 'gods Athena and Poseidon' which intervene and confirm to Achilles that the river will be soon calm (Il.21.292): *'ἀλλ' ὅδε μὲν τάχα λωφήσει, σὺ δὲ εἴσεαι αὐτός'- 'he will soon cease and you yourself will know it'.*

According to the Homeric text, the two rivers, Xanthus-Scamander and Simoes, which flow northward, towards the Hellespont, they are connected at some point (*'ἀλλ' ὅτε δὴ Τροίην ἶξον ποταμώ τε ῥέοντε, ἦχι ῥοὰς Σιμόεις συμβάλλετον ἠδὲ Σκάμανδρος - but when they had come to the land of Troy and the two flowing rivers where the Simois and the Scamander join their streams'*, (Il.5.773-776)). This connection point must be southwards of Xanthus' river ford, because the flooding occured only there. The flood phenomenon does not include Simoes. For this reason, although Xanthus *'invited'* Simoes to flood by adding water from his springs in order both to kill Achilles, Simoes did not *'respond'* (Il.21.311-314). Furthermore, if we assume that a submarine earthquake or a submarine landslide had occurred in the Hellespont and caused a tsunami, it would have simultaneously produced a reversal of both the rivers' flows and it would have flooded the entire plain. A tsunami would have destroyed the ships and the camp itself. No battles could be performed in the flooded plain. Consequently, the normal continuity of the battle would have stopped.

The question which rises here is 'if the described earthquake is related or not with the bolide's explosion' because there are seismic waves which are generated by the sonic blast wave assosiated with the meteor (Angin and Haddon, 1987). When a bolide enters the atmosphere at hypersonic velocities, it produces a ballistic shock wave, within a narrow *Mach Cone*. The induced pressure wave propagates an almost cylindrical wave front. Additional shock waves with quasi-spherical wavefronts can also be produced by the bolide's fragmantation. These shock waves propagate through the atmosphere and could be detected as infrasound waves. These infrasounds impinge the earth's surface with sufficient energy to induce a measurable seismic signal (Edwards et al. 2007). Indeed, Le Pichon et al. (2013) recorded infrasounds in sensors of the Conprehensive Nuclear Test Ban Treaty (CNTBT) associate with the Chelyabisk bolide's explosion (2013). According to Tauzin et al. (2013), in the case of Chelyabinsk event, there are fine seismic records of Rayleigh waves (Figure 8), produced by the coupling of ground motion with the incident shock wave, which was caused by the main sonic blast that it is associated with the observed damages and injuries. These Rayleigh waves were recorded in 4000 km distance away from the focal point of the bolide's explosion.

Additionally, Vasilyev, N.V. (2004) mentions that the two seismic stations placed at Irkutsk Magnetographic and Meteorogical observatory recorded the Tugunska seismic event produced by a bolide's explosion. There are references that have shown simultaneous seismic records with magnitudes ~M5 and ~M4, in connection with the Chelyabinsk and Tunguska bolides' explosions respectively. After the presented analysis, one can not exclude the coupling between the Homeric seismic event and the bolide's explosion.

When Xanthos River overflooded the field and Achilles was in danger, *Hera screamed* fearing for Achilles' life. Another '*sound*' was heard in the atmosphere as *divine voice,* (*Il.21.328,' Ἥρη δὲ μέγ' ἄϋσε'-but Hera cried out*). Hera asked Hephaestus to manifest much *flame* in order to burn the trees and inflame the river until her herself told him to stop (Il.21.333-341). The flame's origin was from a southwest direction with respect to Trojan field, from Aegean Sea side and was coupled by a terrible gale, a fierce blast:

'…ἀλλ' ἐπάμυνε τάχιστα, πιφαύσκεο δὲ φλόγα πολλήν.αὐτὰρ ἐγὼ Ζεφύροιο καὶ ἀργεστᾶο Νότοιο εἴσομαι ἐξ ἁλόθεν χαλεπὴν ὄρσουσα θύελλαν, ἥ κεν ἀπὸ Τρώων κεφαλὰς καὶ τεύχεα κήαι φλέγμα κακὸν φορέουσα· σὺ δὲ Ξάνθοιο παρ' ὄχθας δένδρεα καῖ', ἐν δ' αὐτὸν ἴει πυρί…ἀλλ' ὁπότ' ἂν δὴ φθέγξομ' ἐγὼν ἰάχουσα, τότε σχεῖν ἀκάματον πῦρ'

'…manifest much flame, but I will hurry and rouse from the sea a fierce blast of the West Wind and the white South Wind that will utterly consume the Trojan dead and their battle gear, spreading on the evil flame. And you along the banks of Xanthus burn up his trees and set him about with fire … when I call to you with a shout then stay your unwearied fire.'

We interpret this phenomenon as a *strong shock wave* (*χαλεπὴν ὄρσουσα θύελλαν- fierce blast)* accompanied by a fiery body, a meteorite *('φλόγα πολλήν' - much flame)*, which had been produced by a low altitude flying bolide's explosion (*Hera' scream)*, over Aegean Sea (number 10d, Table 2C). Homer further describes the *fiery gale's* results. This incident burnt the plants and bushes close to Xanthus River and evaporated fully the previously flooded plain close to the river's ford ('πόρος'). Moreover, a second flaming meteorite falls on the river, producing bubbling and eddies and tormented the river's life forms (Il.21.342-345 and Il.21.349-361):

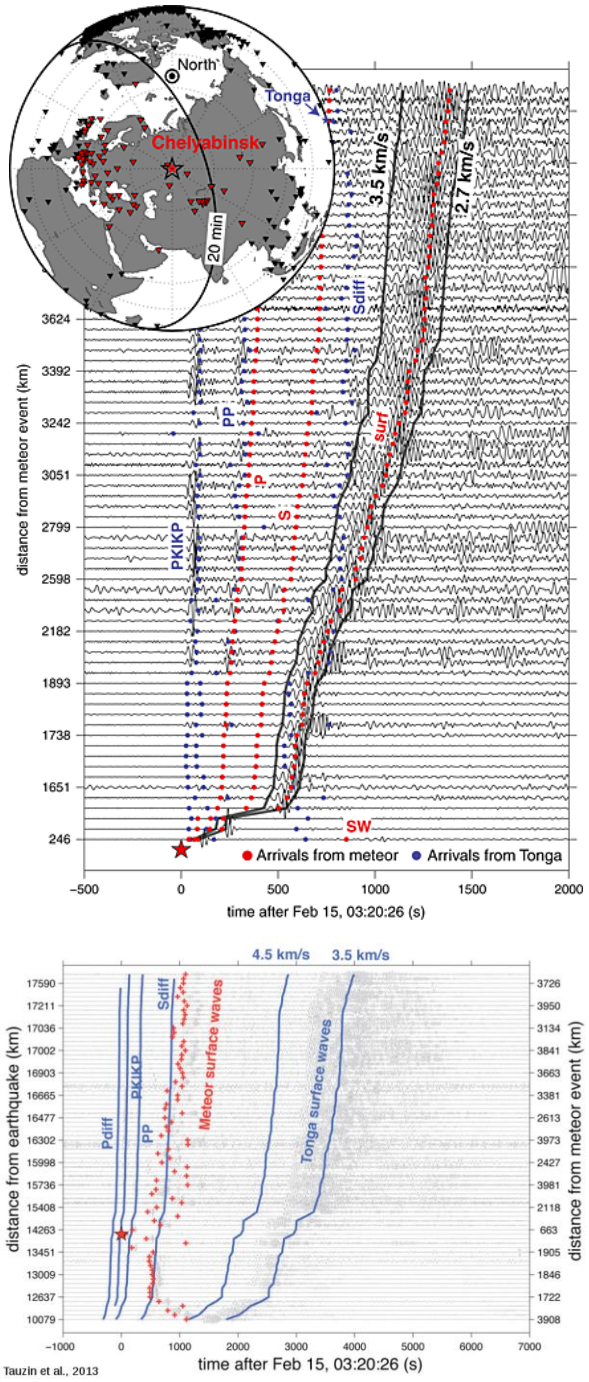

Figure 8. (top) Vertical component seismograms for stations located within ±4000 km from the city of Chelyabinsk. Body waves (PKIKP, PP, and Sdiff) from the Tonga earthquake are indicated with blue dots. The gray curves delineate inferred Rayleigh waves associated with the Chelyabinsk meteor. Predicted travel times for P, S, surface waves, and shock waves (SW) induced by the meteor event are indicated with red dots. The map at the top left shows the location of the city of Chelyabinsk (red star) with all broadband seismological stations within 4000 km (red triangles) and away (black triangles). (bottom) Temporary arrivals of seismic waves associated with Chelyabinsk meteor event (15 Feb. 2013) on which waves from the Tonga earthquake are superimposed. B. Tauzin, E. Debayle, C. Quantin, N. Coltice, 2013, Geophys. Res. Lett., 40, 3522–3526.

''Ἥφαιστος δὲ τιτύσκετο θεσπιδαὲς πῦρ. πρῶτα μὲν ἐν πεδίῳ πῦρ δαίετο, καῖε δὲ νεκροὺς πολλούς…πᾶν δ' ἐξηράνθη πεδίον, σχέτο δ' ἀγλαὸν ὕδωρ.'

'Hephaestus made ready wondrous blazing fire, first on the plain was the fire kindled and began to burn the dead, the many dead…and all the plain was dried and the bright water was stayed.'

'ὃ δ' ἐς ποταμὸν τρέψε φλόγα παμφανόωσαν. καίοντο πτελέαι…τείροντ' ἐγχέλυές τε καὶ ἰχθύες οἳ κατὰ δίνας, οἳ κατὰ καλὰ ῥέεθρα κυβίστων ἔνθα καὶ ἔνθα πνοιῇ τειρόμενοι πολυμήτιος Ἡφαίστοιο. καίετο δ' ἴς ποταμοῖο ἔπος…'' οὐδ' ἂν ἐγὼ σοί γ' ὧδε πυρὶ φλεγέθοντι μαχοίμην….' Φῆ πυρὶ καιόμενος, ἀνὰ δ' ἔφλυε καλὰ ῥέεθρα.'

'And then against the river he turned his gleaming flame. Burned were the elds…tormented were the eels and the fishes in the eddies and in the fair streams they plunged this way and that sorely tormented by the blast of Hephaestus of many wiles. Burned too was the mighty river…nor will I fight you ablaze with fire as you are…So he spoke, burning with fire and his fair streams were seething'

The Homeric expression '*πυρὶ καιόμενος-burning with fire*', gives the impression that Xanthus River was in flames itself. In reality the river's bubbling, the life forms' discomfort and the plants' burning in both the river's sides, gave the optical illusion to a distant observer that the river itself was in flames.

This phenomenon did not last long, due to Hera's 'command' to Hephaestus, to extinguish his fire:

''Ἥρη, αὐτίκ' ἄρ' Ἥφαιστον προσεφώνεεν…Ἥφαιστος δὲ κατέσβεσε θεσπιδαὲς πῦρ, ἄψορρον δ' ἄρα κῦμα κατέσσυτο καλὰ ῥέεθρα'

'Hera immediately she spoke to Hephaestus… Hephaestus quenched his wondrous blazing fire and once more the wave rolled along the fair streams' (Il.21.377-382).

Hera's personification as the atmospheric air, associated with the blast wave's propagation, coupled with Hephaestus' flame (meteorites) seized to function.

8. CONCLUSIONS

We analysed fully some Iliad's descriptions of physical phenomena covered by devine interventions, taking into account that the *old physics* was *hidden* within *mythos* and *theology*, as mentioned by Ploutarch. Additionally, we take into account that in Plato's time, the *logos* was the *historic event* and the *mythos* was divided into *the genuine tradition* and the *fabricated one (Tim.26.e.4-5, Resp.*377.b.6). However, in the Homeric text, according to Homeric Dictionary of Krousios and Seiller (Pantazidis, 1888) and Mitropetrou (2012), *mythos* signified speech, oration, narrative, dialogue, custom, command, advice, suggestion, opinion, the issue of speech, conversation, logical argument etc. (e.g. see Il.12.80 ('*μύθος*

ἀπήμων'-prudent words), Od.1.358-359 *('μύθος δ' ἄνδρεσσι μελήσει πάσι- but speech shall be men's care, for all*), Od.17.153 ('*εμείο δε σύνθεο μύθον'- but hearken to my words),* Od.21.67 ('*αὐτίκα δὲ μνηστῆρσι* ***μετηύδα*** *καὶ φάτο μῦθον - at once she spoke among the suitors and said*), Od.21.70-71 ('*οὐδέ τιν' ἄλλην μύθου ποιήσασθαι ἐπισχεσίην ἐδύνασθε'-nor could you find any other plea to urge*) etc)). The corresponding verb is 'μυθέομαι' means 'speak' or 'say'. Later, in the advancing centuries, the meanings of mythos and logos are changed. Consequently, in Iliad, the old physics (the physical phenomena) was hidden behind theology (devine interventions) and mythos signify the genuine tradition; oral tradition, by disseminating speech.

We initially recognized many *physical events* as different 'divine' interventions attributed to *'gods and godesses'*. However, after highly detailed multiscientific analysis, we concluded that the main source of these physical events was *a very strong meteor shower*, which contained bolides' explosions, fireballs' breakages and meteroid's impacts on the ground. Also, *two seismic activities* within a two day time period are described. The first was a typical earthquake produced by a known seismotectonic mechanism, whereas the second seems to be a rear case of an earthquake produced by a seismoacoustic coupling between the infrasounds of a supersonic blast in the atmosphere and the production of *P, S, Love* and *Rayleigh* waves (Figure 8) on the ground. Such an event was recently recorded in Chelyabinsk (2013) and analysed by Tauzin et al (2013). We note that these *events* coexisted with *a solar eclipse* which have been described by Henriksson (2012) and Papamarinopoulos et al. (2014). The *red cloud's appearance* during the solar eclipse's maximum phase is interpreted absolutely, taking into account the specific existing climatic conditions during the solar eclipse (sharp temperature drop with simultaneous humidity rise) and the remaining fragments of a bolide in the atmosphere.

It is worth to notice that Homer has chosen to describe only this specific 7-day time period around the Patroclus' death, out of the entire 10-years period of the war. This does not include the Acheans' principal hero, Achilles' death, or the conquest of Troy by Dourian Horse. Therefore we reach the unavoidable conclusion that this happened just because of all these 'extreme' physical events occurred in that week. And it was natural for the observers of that prehistoric period to attribute these 'extreme' physical events in 'divine' activities.

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DEDICATION

We dedicate this paper to Emeritus Professor Stephanos A.Paipetis, from Kerkyra Island, of the University of Patras in Greece the scientist who first started the study of Homer's Epics, worldwide, from the standpoint of Science and Technology, an excellent researcher with international impact, an analyst of myths, poetry and a pure student of the Universe's enigmas a person with a unique sense of humor.

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