

Lightning distribution analysis for Natural Hazard prediction

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The group of two Elves and 84 Sprites are associated with different lightnings which took place in the seismological active region from 2 till 5 September 2008. TLE's started one day after the closest earthquake. The seismic activity in this place lasted up to four months after that. The next earthquake in this place happened with higher Magnitude 4.2 on February 26, 2012. The lightning activity together with TLE's registration can be ones of the new earthquake predictors. The mapping of negative and positive lightning together with TLE's can be helpful for detection of active faults and its tension. So the area of possible earthquakes can be localised in space and time.

1. General

The climate change leads to the climate anomalies what increase the number of extreme weather related events two times for 10 past years. One can see the rise of the droughts and floods parameters such as frequency, duration, intensity and severity. The economical losses and risks are increasing corresponding to them.

Another group of extremely deadly natural hazard is earthquakes and tsunamis. The prediction of the earthquakes is very difficult and has a low probability. The most difficult problem is the space-time paradox. So if we have proper information on the place of the earthquake we will be mistaken in the time of the event very much.

The meteorological observation of the thunderstorms with lightning detection together with seismological monitoring of the earthquakes can be helpful for finding the new precursors of the earthquakes.

2. Lightning and Earthquake

The possibility of synchronisation of lightning activity with earthquakes was discussed in previous papers [1, 2]. That is possible owing to the anomalous seismo-electromagnetic emission [3]. The mechanism responsible for triggering of Positive Lightning and TLE's related with exact seismic waves from the earthquakes [4, 5].

Within the observation time the Corsican System Instrument (EuroSprite-2008 Campaign) was targeted in the most Radar contrast area of the thunderstorm. The thunderstorm was very active from 2 till 5 September 2008 [5] and within four days it was situated in the same place.

The group of two Elves and 84 Sprites (fig. 1) associated with different lightnings took place in the seismological active region. The central point of TLE's group was in the coordinates: Lat(mean)=45.17, Lon(mean)=5.97. TLE's started one day after the closest earthquake (Lat=45.982, Lon=6.165, Depth=2 km, Mw=2.5 (NEIC), 30 August 2008, 2:33:06.6 U.T.).

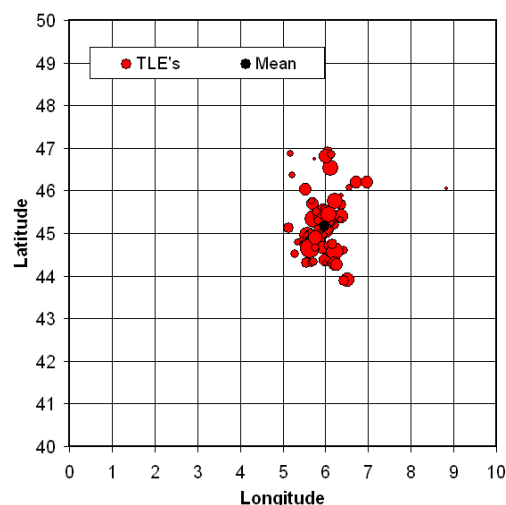


Fig. 1: Compact TLE's group of two Elves and 84 Sprites (2-5 September 2008, EuroSprite-2008 Campaign).

The seismic activity in this place lasted for four months after that (fig. 2) up to the end of 2008. The next earthquake in this place happened with higher Magnitude 4.2 on February 26, 2012 (Lat=44.538, Lon=6.658, Depth=2 km, Mw=4.2 (NEIC), at 22:37:55.79 U.T.).

For visualisation of negative and positive lightning distribution the current density maps were calculated on the base of Meteorage Data from 13 June to 11 October 2008.

One can see the area in the centre of the negative lightning current density map (fig. 3) very close to the TLE's group (fig. 1).

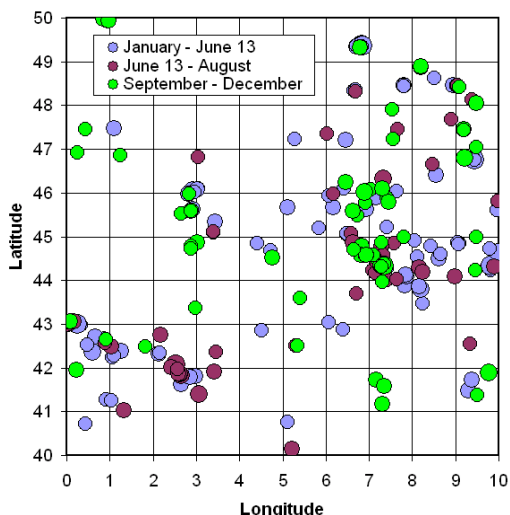


Fig. 2: Earthquake map during 2008 (NEIC USGS Catalog PDE).

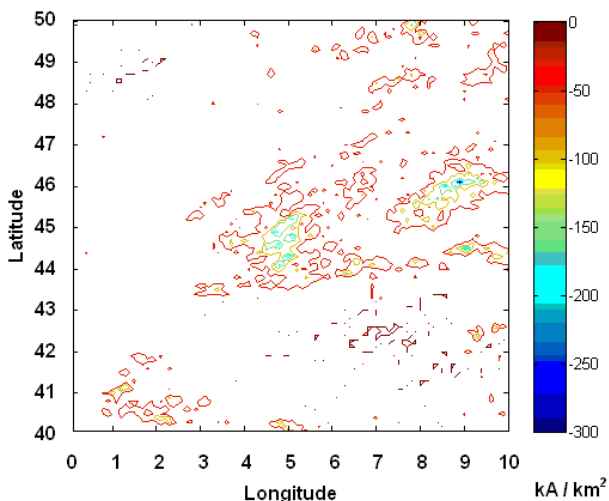


Fig. 3: The density map of negative lightning current in kA per square kilometre (Meteorage Data from 13 June till 11 October 2008).

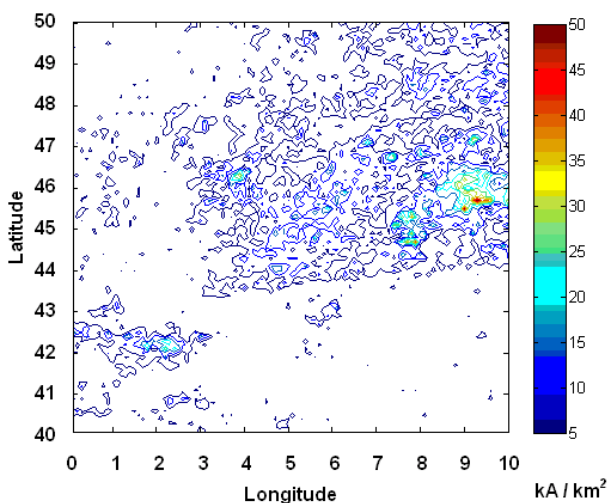


Fig. 4: The density map of positive lightning current in kA per square kilometre (Meteorage Data from 13 June till 11 October 2008).

The positive lightning current density map (fig. 4) looks like the earthquake map (fig. 2) with the maximum of positive lightning activity close to the earthquake epicentre.

3. Conclusion

The lightning activity together with TLE's registration can be one of the new earthquake predictors. The mapping of negative and positive lightning together with TLE's can be helpful for detection of active faults and its tension. So the area of possible earthquakes can be localised in space and time.

4. References

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