

**Development and assessment of a robust GPS-TEC data analysis (RST<sub>TEC</sub>) for the identification of ionospheric perturbations possibly related to impending earthquakes: the case of L'Aquila (April 6<sup>th</sup>, 2009, Mw=6.1) earthquake.**

**R. Colonna<sup>1</sup>, V. Tramutoli<sup>1</sup>**

*<sup>1</sup>University of Basilicata, Potenza, Italy, r.robertocolonna@gmail.com;*

This work aims to propose a new approach for the detection of anomalous behaviours of the Total Electron Content (TEC) parameter in ionosphere, possibly associated to impending strong earthquakes.

The new approach proposed is defined RST<sub>TEC</sub> because based on the general approach Robust Satellite Technique (RST; Tramutoli, 1998; 2005; 2007) but reformulated in order to be applicable to the TEC measurements.

The TEC measurements used in the analysis are recorded by the Global Positioning System (GPS) satellite constellation.

As first application, the RST<sub>TEC</sub> approach is employed on the case study of the 2009 L'Aquila earthquake (Italy).

The focus of the approach is to compute a set of values named  $\Delta_{TEC}$  in the 15 days before the earthquake, in the geographical region of the earthquake and at regular time intervals. The  $\Delta_{TEC}$  values are given from the differences between the measured VTECs and their "15-day moving medians" (Liu et al., 2000, 2001, 2004). As usual, the 15-day moving medians are calculated in the same time slot and geographic area of the value under investigation.

Once this set is obtained, other sets of  $\Delta_{TEC}$  are calculated in the same way and in the same days, but during the previous years. These sets are used as reference values.

In this way is possible to compare every single time slot of every single day under investigation with a reference value (in the specific case the mean) computed by using a significant sample of values related to the same time slot and to the same period of the year of the value investigated.

In this work result achieved in the case of L'Aquila (April 6<sup>th</sup>, 2009, Mw=6.1) earthquake will be discussed.

## References

- Liu J. Y., Chen Y. I., Pulinets S. A., Tsai Y. B. and Chuo Y. J. 2000, “Seismo-ionospheric signatures prior to  $M \geq 6.0$  Taiwan earthquakes”, *Geophys. Res. Lett.*, 27, 3113–3116.
- Liu J. Y., Chen Y. I., Chuo Y. J., and Tsai H. F., 2001, “Variations of ionospheric total electron content during the Chi-Chi earthquake”, *Geophys. Res. Lett.*, 28, 1383–1386.
- Liu J. Y., Chuo Y. J., Shan S. J., Tsai Y. B., Chen Y. I., Pulinets S. A. and Yu S. B., 2004, “Pre-earthquake ionospheric anomalies registered by continuous GPS TEC measurements”, *Ann. Geophys.*, 22, 1585–1593.
- Tramutoli V., 1998, “Robust AVHRR Techniques (RAT) for environmental monitoring: theory and applications.” In: Cecchi G. and Zilioli E. (eds), *Proc. SPIE, Earth Surf. Remote Sens. II*, Barcelona, Spain, Vol. 3496, pp. 101-113.
- Tramutoli V., 2005, “Robust Satellite Techniques (RST) for natural and environmental hazards monitoring and mitigation: ten years of successful applications.” In: *Proc. 9th Int. Symp. Phys. Meas. Signatures Remote Sens.*, Beijing, China, XXXVI, pp. 792-795.
- Tramutoli V., 2007: “Robust Satellite Techniques (RST) for natural and environmental hazards monitoring and mitigation: theory and applications.”, in: *Proc. Int. Workshop Anal. Multi-Temporal Remote Sens. Images (MULTITEMP)*, Louven, Belgium, pp. 1-6.