Remote sensing from Synthetic Aperture Radar (SAR) plays an active role in environment monitoring. Particularly, Differential Interferometric (DInSAR) based techniques [1][2] represent a unique instrument for the monitoring of risk situations associated to ground movements. The key feature of DInSAR is the capability to provide deformation maps with centimetric to millimetric accuracy, over large areas of several tens of square kilometres, with a spatial resolution reaching one meter with the latest generation X-Band SAR sensors as the TerraSAR-X. Currently, high resolution SAR sensors open interesting perspectives of further enhanced applications thanks to an exponentially increased density of the information and reduced revisiting times. The high spatial resolution allows in fact accurate and spatially dense monitoring even of each single site of interest. As a recent extension of classical DInSAR processing, Differential SAR Tomography [3] has been proven to be an effective technique, working at full resolution, allowing improving the quality of the information that is extracted from the SAR dataset, principally in terms of increased density of the monitored ground points and better accuracy in the estimation of their localization and deformation parameters. In this paper, we discuss the results of the processing via tomographic techniques of TerraSAR-X both over rural and urbanized areas. The first results are carried out within the GEO1225 “Monitoring of urban areas affected by landslides with TerraSAR-X data” proposal and are relevant to the Provincia of Catanzaro, in the southern part of Italy. The area of interest is located over a mountainous site and is heavily affected by a large number of landslides which represent a serious risk for close urban areas. The wide spatial coverage of SAR sensors allows monitoring all these landslides at once and can play a relevant role in the mitigation of risk to city facilities and residential buildings interacting with landslides. The GEO1225 data are acquired in the spotlight mode and hence the processing chain has been updated to account for the azimuth variation of the Doppler centroid. Secondly, results carried out within the MTH0749 proposal allows appreciate the very high sensitivity of X-Band data acquired by the TerraSAR-X. In fact, the use of the short (about 3.1cm) wavelength makes the radar more sensitive to very slight movements, even those caused by thermal dilation of materials. However, the thermal dilation component increase the non-linear deformation component and can cause loss in the detection of scatterers at full resolution. To counteract this effect, the deformation model exploited in Differential SAR Tomography has been upgraded to account for the presence of a new contribution linearly related with local temperatures at acquisition instants. In this way, a new product can be estimated, namely a map representing a thermal coefficient measured as a length for temperature unit. The application of this technique to the data acquired over the city of Potenza, southern Italy, allowed precisely monitor the response of a specific bridge and particularly the different behaviour of the thermal dilation over the different segments of the bridge [4].

REFERENCES