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The range split-spectrum method for ionosphere estimation applied to the 2008 Kyrgyzstan earthquake

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L-band remote sensing systems, like the future Tandem-L mission, are disrupted by the ionized upper part of the atmosphere called ionosphere. The ionosphere is a region of the upper atmosphere composed by gases that are ionized by the solar radiation. The extent of the effects induced on a SAR measurement is given by the electron density integrated along the radio-wave paths and on its spatial variations. The main effect of the ionosphere on microwaves is to cause an additional delay, which introduces a phase difference between SAR measurements modifying the interferometric phase. The objectives of the Tandem-L mission are the systematic monitoring of dynamic Earth processes like Earth surface deformations, vegetation structure, ice and glacier changes and ocean surface currents. The scientific requirements regarding the mapping of surface deformation due to tectonic processes, earthquakes, volcanic cycles and anthropogenic factors demand deformation measurements; namely one, two or three dimensional displacement maps with resolutions of a few hundreds of meters and accuracies of centimeter to millimeter level. Ionospheric effects can make impossible to produce deformation maps with such accuracy and must therefore be estimated and compensated. As an example of this process, the implementation of the range split-spectrum method proposed in [1,2] will be presented and applied to an example dataset. The 2008 Kyrgyzstan Earthquake of October 5 is imaged by an ALOS PALSAR interferogram; a part from the earthquake, many fringes due to strong ionospheric variations can also be seen. The compensated interferogram shows how the ionosphere-related fringes were successfully estimated and removed.

[1] Rosen, P.A.; Hensley, S.; Chen, C., "Measurement and mitigation of the ionosphere in L-band Interferometric SAR data," Radar Conference, 2010 IEEE , vol., no., pp.1459,1463, 10-14 May 2010
[2] Brcic, R.; Parizzi, A.; Eineder, M.; Bamler, R.; Meyer, F., "Estimation and compensation of ionospheric delay for SAR interferometry," Geoscience and Remote Sensing Symposium (IGARSS), 2010 IEEE International , vol., no., pp.2908,2911, 25-30 July 2010