Natural Hazards and Earth System Sciences

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Discussions

Interactive comment on "Estimation of three-dimensional crustal movements in the 2011 Tohoku-oki, Japan earthquake from TerraSAR-X intensity images" *by* W. Liu et al.

Anonymous Referee #2

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The paper demonstrates, how 3D displacement vectors can be derived from multi-temporal, multi-aspect SAR images. The topic and methdodology is not new, but the work was performed with sufficient GPS ground truth and is presented clearly, which deserves publication.

I recommend the following changes before acceptance and final publication:

- p 2, l 5: It is not only "difficult" to derive 3D information from 2D observations, it is impossible.

- p 3, l 16: I think it not correct, that two InSAR obervations deliver 2,5 D information.

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Interactive Discussion

Discussion Paper

From two 1D observations we can only derive 2D, if the observation geometry is different (2D). The missing dimension is often amended by model assumptions (e.g. vertical or horizontal motion). The Term 2,5D is often used for DEMs and is not appropriate here.

p 5, l 12-13:Speckle in general does not reduce the correlation. Indeed it will increasse the correlation as long as it is coherent speckle which should be true in urban areas without vegetation. Even if the speckle is incoherent, the correlation process acts as a smoothing filter anyway and reduces the effect of incoherent speckle. Therefore I suspect, the Lee-Filter is irrelevant and even negative because it will destroy coherent speckle correlation. I request the authors to comment on this.

p 5, l 17: The 0.3 m accuracy are probably correct and caused by atmosphere and solid earth tides. Recent papers demonstrated that the geolocaiton accuracy of TerraSAR-X images can be improved to a few centimeters after correction of atmospheric refrativity and Earth surface dynamics. See: - M. Eineder, C. Minet, P. Steigenberger, X. Cong, and T. Fritz, "Imaging geodesy - Toward centimeter-level ranging accuracy with TerraSAR-X," Geoscience and Remote Sensing, IEEE Transactions on, vol. 49, no. 2, pp. 661–671, 2011 - Xiaoying Cong; Balss, U.; Eineder, M.; Fritz, T., "Imaging GeodesyâĂŤCentimeter-Level Ranging Accuracy With TerraSAR-X: An Update," Geoscience and Remote Sensing Letters, IEEE , vol.9, no.5, pp.948,952, Sept. 2012

p 7 l 7: "Two-dimensional displacement detection". This should probably be a new headline.

p 10, l 20: At this point the reader will ask: Why don't you put all observations in one equation system. You are doing this in a later chapter. Please add an explanation at this point why you handle pairs of observations at this point.

p 11, l 3: "similar and stable" are rather unprecise terms. Please quantify or qualify and explain what means "stable".

p 11, l 22: It is not quite clear to me how the RMS is calculated from which and how many observations?

p 12, chapter 4.2: This is the obvious methodology for me. As mentioned before: why not immediately go to this step?

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 7383, 2014.