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Natural Hazards and Earth System Sciences
Discussions
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Interactive comment on "Modeling of fast ground subsidence observed in southern Saskatchewan (Canada) during 2008–2011" *by* S. V. Samsonov et al.

Anonymous Referee #3

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Comments to Author:

The paper presents space geodetic (InSAR from RADARSAT-2 satellite) observations of fast ground displacement (subsidence) occurred in Southern Saskatchewan (Canada) between the city of Saskatoon and Rice Lake in the period during 2008-2011. The authors suggest that the fast subsidence is caused by volume variation of a spherical or sill type source, probably due to human activities (potash mining). The 23 ascending MF3F and 15 descending S3 radar images were used to perform time series analysis utilizing SBAS and MSBAS technique around the subsided area. Furthermore two highly coherent Interferograms were used in order to non-linearly invert

for the position (Lon, Lat), depth, radius and volumetric variation (ΔV) of the source (sphere or sill).

General Comments: The manuscript presents convincing evidence about the InSAR detected subsidence of two nearly circular regions 1-2km in diameter and separated by about 1000m. Methods are very well described in general, and with excellent clarity. The topic of the paper is an important one, as a human activities related with active mining in populated areas represents a significant challenge for the future of natural resources. Questions related to the safety of mining fields, particularly if near populated areas are still under debate from the scientific (and not only) community. Furthermore there is a variety of scientist interested (seismologists, geochemists, geodesists...) in this type of phenomena that make a good paper citable. I feel that, although the paper presents a routine application of well known procedures for InSAR processing and inversion of InSAR data, it might by an important piece in understanding subsidence phenomena related with human activities. As such, the paper is well suited for a publication in NHESS.

Specific comments: The results you presented for the joint descending-ascending inversion shows that the sill type source presents a lower (-1.1cm) RMS value. But, is from the statistical point of view the sill source more significant than the spherical one? Can you say something more by (for example) using an F-type scheme statistical test in order to asses better the differences between the two geometries? I feel that such additional test would indeed be very helpful and improve the quality of the paper. You have not addressed anything about if one of these two sources is more compatible with what expected from the potash mining operations. Please comment on that. One of the important topics in this paper is the fast subsidence. Do you have other data on the surface expression or other ground observations of cracks, oriented fractures etc. Finaly, is there any seismological observations from within the mining field? Figures: I think that you should add the residuals as a green line in Figs 4d to 7d and Figs 8g,h and 9g,h

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 5881, 2013.