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Inflation of Aira Caldera (Japan) detected over Kokubu urban area using SAR interferometry ERS data

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Abstract. Nine ERS-1 and ERS-2 descending orbit data acquired over the Aira Caldera between June 1995 and November 1998 were used to create 31 differential interferograms. Although the interferograms exhibit a relatively low level of coherence, even for couples sampling short time intervals (6 months), Differential Interferometric Synthetic Aperture Radar (DinSAR) reveals a pattern of range change signal during the observation period in the urban area of Kokubu city. The analysis of the ground deformation time series relative to the earliest ERS images evidenced a maximum uplift of 23 mm between the north and the south of the city during the studied period. Taking the reduced surface of the coherent area into account, we performed a simple modelling of the deformation field assuming a spherical inflating source within an elastic half-space medium. This simple model predicts a source located beneath the centre of Aira Caldera with a maximum volume increase of 30 10^6 m^3 between 1995 and 1997, which would produced an inflation of about 7 cm of the centre of Aira Caldera and 4 cm of the south of Kokubu city. These results are in good agreement with other geophysical observations carried out on Aira caldera during this unrest period. Despite the limited spatial extent of the coherent areas around Aira Caldera, this study shows that DinSAR method using ERS data can be successfully used to detect subtle ground displacement changes of the volcanic complex and thus provides complementary information to ground-based geodetic monitoring of dynamic processes at Aira Caldera and Sakurajima volcano.

Discussion Paper (PDF, 2232 KB) Interactive Discussion (Closed, 4 Comments) Final Revised Paper (eE)

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