



Alpine Glacier Monitoring by Satellite SAR-Interferometry: The Example from Pasterze Glacier, Austria

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Detection and satellite-based measurement of surface velocities at the largest ice mass of Austria, the Pasterze Glacier, Hohe Tauern Range (47°05'N, 12°44'E, ca. 17.5 km²) has been performed by means of differential SAR-Interferometry (DINSAR). For this analysis, 15 SAR-images recorded during the summer period were available for the years 1995 to 2001. One out of three analysed image pairs of the ERS-(European Remote Sensing Satellite)-Tandem-Mission (20.-21.8.1995) showed sufficient coherence at the partly debris-covered glacier tongue of Pasterze Glacier for deriving a significant interferogram (displacement image). This was possible despite the fact that only SAR-imagery of descending orbit (geometrically less favourable for displacement measurements) were available. During this one-day observation period in summer 1995, maximum surface displacement rates of 30-40 mm per day in the SAR-line-of-sight have been calculated. Based on our results and additional simplifying assumptions (e.g. glacier flow parallel to the surface, steady glacier displacement all year round), a maximum annual surface displacement rate of 40 to 50 m for the year 1995 can be estimated. These values are comparable with the glacier velocities measured tachymetrically in the field. The example clearly shows the potential of DINSAR for alpine glacier monitoring in mid-latitude environments with high relief and demonstrates the high importance of sufficient coherence. It can be concluded that only ERS-Tandem-Mission images (time interval of one day) can be applied at such glaciers for surface

displacement analyses focussing on the summer period.