Ground-based radar for the monotoring of the landslide "Ruines de Séchilienne"

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The village of Séchilienne is located about twenty kilometres east of Grenoble in the French Alps. A landslide involving a volume of more than 25 millions cubic meters of highly tectonised quartzeous micaschists threatens it: the "Ruines de Séchilienne". A monitoring system, based on wire extensometers, geodetic data and infrared distance measurements, has been installed since 1985. 1 to 5 mm/day mean velocities have been measured and displacements reached several meters in twenty years in the fastest area of the unstable mass. The supposed mechanism is a complex 3D one, including sagging and toppling, with a high structural control.

This paper describes a microwave distance measurement technique specially designed for real time monitoring of the landslide. The radar is located on the opposite slope, facing to the Ruines; the distances are measured automatically every 4 hours between the radar and 11 reflectors set in the landslide. The precisions achieved are in the range of a few tenths of millimeter at a distance of 1200 m. The data obtained enable global time monitoring of the movement changes, regardless of the meteorological conditions.

The principles used, the difficulties encountered and the methods adopted to overcome these problems, are described here. The system has been on site for more than two years, and we now have sufficient hindsight to present a few experimental results illustrating what can be expected from this type of instrument.

Moreover, to avoid misunderstanding, we shall notice that this method, introducing a new accurate measurement concept is definitely different from the interferometric radar techniques carried out over ERS SAT data.