



## High Resolution Radar Measurements of Snow Avalanches

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Geophysical mass flows, such as snow avalanches, are a major hazard in mountainous areas and have a significant impact on the infrastructure, economy and tourism of such regions. Obtaining a thorough understanding of the dynamics of snow avalanches is crucial for risk assessment and the design of defensive structures. However, because the underlying physics is poorly understood there are significant uncertainties concerning current models, which are poorly validated due to a lack of high resolution data. Direct observations of the denser core of a large avalanche are particularly difficult, since it is frequently obscured by the dilute powder cloud. We have developed and installed a phased array FMCW radar system that penetrates the powder cloud and directly images the dense core with a resolution of around 1 m at 50 Hz over the entire slope. We present data from recent avalanches at Vallee de la Sionne that show a wealth of internal structure and allow the tracking of individual fronts, roll waves and surges down the slope for the first time. We also show good agreement between the radar results and existing measurement systems that record data at particular points on the avalanche track.