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MODELLING AND MONITORING SNOW REDISTRIBUTION BY WIND

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As part of the effort of the Centre d'Etudes de la Neige (CEN), Météo France, for the improvement in modelling snow cover evolution and avalanche risk forecasting, a numerical simulation of snow transport and related mechanical effects on snow particles morphology has been developed during the last years. The objective is to incorporate the wind effects into the Météo France operational chain Safran-Crocus-Mepra for avalanche risk forecasting. At present, an evaluation version of the model is applied to a well instrumented site (Col du Lac Blanc 2700 m, French Alps), in order to assess its performance and validate its applicability. Here, in addition to nivo-meteorological stations, several specific snow drift sensors and a range of snow depth poles, a novel remote sensing technique based on terrestrial photography is being applied. In order to get a general validation of the model it is necessary to gain information of the snow cover evolution at a very high temporal and spatial resolution, yet the method needs to be relatively simple and economical. For this purpose the most adequate tool seems to be the use of oblique digital photographs of the area, which are taken frequently from an elevated viewpoint. These photographs are then georeferenced to a digital elevation model and analysed using different techniques of image processing applied to remote sensing. The main purpose of this tool is identifying areas of snow erosion and deposition that can be compared to the output of the model. The average magnitude of the variation in snow depth after a snowdrift event is of the order of a few cm. This change can be measured precisely at a few points, but it is too small to permit a direct measurement over medium or large areas. However, such a change is important to assess the stability of the snow pack, due to both, redistribution of load and mechanical changes in the snow grain subject to wind transport. Although the actual variation in snow depth is too small to be detected using this technique (or any other remote sensing technique of practical use), the effects of wind transport, erosion, accumulation

and snow grain sphericity can be monitored by measuring the associated changes in albedo, slope angles, texture and texture orientation, feature variations, etc. The results for the ongoing campaign on the 2002-2003 winter will be presented and discussed.