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Performance evaluation of the mescan precipitation reanalysis system in mountainous areas during winter.

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The analysis of meteorological parameters over mountainous terrain still poses a challenge due to the irregular spacing of observations and their specific situation with respect to topography. For snowpack-related issues such as avalanche hazard and hydrological forecasting, the SAFRAN surface analysis system is used in an operational context to drive land surface model. The design of SAFRAN makes it hardly portable over any other region outside France since it performs analysis of atmospheric variables on climatologically homogeneous areas of irregular shape.
At Météo-France, it is scheduled to replace the precipitation SAFRAN analysis system by the MESCAN (Soci et al, 2016) system, which is based on a two-dimensional univariate optimum interpolation (OI) between the precipitations gauge measurements and a background field. In this framework, the MESCAN high-resolution precipitation reanalysis system, was assessed in mountainous areas (French Alps) during winter from 2015 to 2017. The background of 24-h accumulated precipitation from 6 UTC until 6 UTC next day, comes from the NWP AROME model at 1.3-km grid spacing.
The well known under catch of solid precipitations by the rain gauges has been taken into account through the estimation of the daily snow water equivalent (SWE) at rain gauge location. The estimation of SWE were calculated with the aid of the daily fresh snow depth measurements, the daily two meter temperature and 10m wind magnitude.
A sensitivity study to OI parameters of the MESCAN system have been also performed. Differents formulations of the structure function, variance of background and observation errors have been explored. All versions of the MESCAN precipitation reanalysis were evaluated with off-line simulations, made by the French land surface model SURFEX over France, driven by meteorological forcing from the SAFRAN analysis system combined to the MESCAN precipitation reanalysis, that were compared to in situ measurements such as snow depth.Evaluation have been performed for several winter in mountainous area and compared to the operational system based on SAFRAN. The origin of bias will be discussed.