Session: C31 Poster: W131A

Snow analysis for numerical weather prediction at ECMWF

Patricia de Rosnay[†]; Gianpaolo Balsamo
[†] ECMWF, United Kingdom
Leading author: Patricia.Rosnay@ecmwf.int

Land surface analysis is a crucial component of Numerical Weather Prediction (NWP) systems. Land surface analysis provides initial conditions of surface prognostic state variables which influence the accuracy of the forecast. At ECMWF the land surface analysis includes several components for (i) screen level parameters analysis, (ii) soil moisture and temperature analysis and (iii) snow analysis. This presentation focuses on the influence of snow analysis on the forecast. The 2009/2010 and 2010/2011 winter seasons, with cold and snowy conditions in Europe and North America, have highlighted the importance of snow analysis for NWP applications. Snow can have significant impact on low level atmospheric temperature, directly affecting the accuracy of forecasts. Furthermore, snow water equivalent influences the evolution of soil moisture for up to several months after snow melt. A new improved snow analysis was implemented in November 2010 as part of the ECMWF operational Integrated Forecasting System (IFS). The new snow analysis uses an Optimum Interpolation (OI) surface analysis scheme to replace the previous Cressman snow analysis (Cressman, Mon. Weather. Rev, 1959). The specification of structure functions for the OI snow analysis closely follows the implementation of Brasnett, (J. Appl. Meteorol, 1999), at the Canadian Meteorological Centre. In addition, the new snow analysis uses the 4-km resolution NOAA/NESDIS (National Oceanic and Atmospheric Administration - National Environmental Satellite, Data, and Information Service) IMS (Interactive Multisensor Snow and Ice Mapping System) snow cover information. The use of SYNOP data in the snow analysis has been improved by implementing a data Quality Control. This paper presents the new snow analysis scheme implemented at ECMWF. Performances of the new snow analysis are presented and compared against the previous Cressman analysis. The new snow analysis is in better agreement with ground observations. In addition skill are evaluated in terms of screen level parameter forecast skills and atmospheric circulation impact. The new snow analysis is shown to improve 2 meter temperature forecasts. And it is also shown to have a positive and significant impact on the northern hemisphere geopotential field at 500mb for more than 5-day forecasts range.