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An upgraded version of the Eta Model applied to Antarctic case studies

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Upgrades have been implemented over a number of years in an open source version of the Eta Model, posted at its CPTEC web site (http://etamodel.cptec.inpe.br/). They were summarized in Mesinger et al. (2011) and examined in detail in Mesinger et al.(2012). In short: within dynamics, two major upgrades are the introduction of "sloping steps" and the use of the piecewise-linear vertical advection of dynamic variables. Several refinements on the calculation of exchange coefficients, conservation in the vertical diffusion, and diagnostic calculation of 10-m winds have been made. Vapor and hydrometeor loading in the hydrostatic equation were included. Within physics, efforts in refining the two Eta convection schemes received most attention.
This recent version of the Eta Model has been applied to polynya events, accompanied by katabatic wind, at Terra Nova Bay (TNB), Antarctica. The TNB polynya is an area of coupling between the components of the sea ice-ocean-atmosphere system. Locally enhanced surface exchange processes are considered to have important consequences for the atmosphere (Morelli, 2011) and ocean processes, as well as for ice formation and the associated brine release. Adjustments of the Eta pre-processor have been made to allow for the distinctive polar conditions and for the use of ECMWF data as initial and boundary conditions. It is also being developed a thermodynamic model of sea ice interaction for a more realistic treatment of the sea ice-atmosphere. The numerical simulations have a horizontal resolution of about 8 Km. The results will be compared with observational data at the surface, with soundings and satellite images. The observations, used for the comparison, are available by Antarctic Meteorological Research Center, Space Science and Engineering Center, University of Wisconsin-Madison and the Programma Nazionale di Ricerche in Antartide (P.N.R.A.), Osservatorio Meteo-Climatologico.

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