MASTER OF SCIENCE
IN
METEOROLOGY

THE NEW DATA ASSIMILATION SYSTEM AT THE ITALIAN AIR FORCE WEATHER SERVICE: DESIGN AND PRELIMINARY RESULTS

Massimo Bonavita-Captain, Italian Air Force
M.S., University of Rome, 1992
Master of Science in Meteorology-September 2002
Advisor: Carlyle H. Wash, Department of Meteorology
Second Reader: Roger T. Williams , Department of Meteorology

In this thesis, a new data assimilation system is presented which has been designed and implemented at the National Center for Aeronautic Meteorology and Climatology of the Italian Air Force (CNMCA) in order to improve its numerical weather prediction capabilities and provide more accurate guidance to operational forecasters. The system, which is undergoing testing before eventual operational use, is based on an "observation space" version of the 3D-Var method for the objective analysis component, and on the High Resolution Regional Model (H.R.M) of CNMCA for the prognostic component. New features of the system include completely rewritten correlation functions in spherical geometry, derivation of the objective analysis parameters from a statistical analysis of the innovation increments, introduction of an anisotropic component in the correlation functions, solution of analysis equations by a conjugate gradient descent method. The analysis and forecast fields derived from the assimilation system are subjectively and statistically evaluated through comparisons with parallel runs based on European Centre for Medium Range Weather Forecast (ECMWF): preliminary results of these studies are also presented.

KEYWORDS: Data Assimilation, Objective Analysis, 3D-Var Algorithm