Observing Systems Simulation Experiments using the NCEP data assimilation system

Stephen J. Lord, M. Masutani, J. S. Woollen, J. C. Derber, R. E. Kistler, T. J. Kleespies, H. Sun, G. D. Emmitt, S. A. Wood, S. Greco, J. Terry, and R. Atlas

Abstract

National POES System (NPOESS) is scheduled to fly during the 2007-2010 period. The impact of future instruments such as Doppler Wind Lidar (DWL) need to be assessed with experiments using simulated observations. These experiments are known as Observing System Simulation Experiments (OSSEs). OSSE will provide a guideline for selection and design of the instrument.

This project is a collaboration among several organizations. Data assimilation is performed mainly by a technology-neutral organization such as the National Centers for Environmental Prediction (NCEP). Simpson Weather Associates (SWA) has simulated Doppler Wind Lidar (DWL) observations, and the National Environmental Satellite, Data and Information Service (NESDIS) simulated TOVS level 1B and atmospheric infrared sounder (AIRS) data. NASA/DAO simulated conventional observations including ACARS and cloud track winds.

The first "nature run" (true atmosphere for the OSSEs) was provided by the European Centre for Medium- Range Weather Forecasts (ECMWF) for February 1993. The representativeness of the nature run was evaluated and found to be suitable to conduct OSSEs after some adjustment for low level cloud. Alternative nature run has been also prepared by NASA/DAO including summer and is being evaluated.

Data impact of existing instruments in real and simulated data are compared for calibration. The impact test showed satisfactory similarity of TOVS 1B data and RAOB wind between real and simulated analysis. The difference between the nature run and real surface height causes difference in impact of surface data. The adjustment for surface data and its error assignment is being conducted.

For DWL OSSE, the bracketing OSSEs are being performed for various concepts to bound the technology-neutral potential impact. Scanning: wavelength; data sampling strategies: various error characterizations are tested through the bracketing OSSE. The results show that scanning is most important, particularly in upper atmosphere. Penetration is important in lower troposphere.

The first set of AIRS data has been simulated and is being evaluated. The simulation of cloud motion vectors is under preparation. DWL needs to be assessed with these new simulated data.

Through OSSEs at NCEP, the operational data assimilation systems will be ready to handle new data in time for the launch. This process involves the evaluation of the operational load, the development of the data base and data-processing, and a quality control system. All of this development will accelerate the operational use of data from the future instruments.