

Preface

Adjoints of models are powerful tools for many applications where sensitivity of output measures with respect to input data must be determined. Such output measures include those defining accuracy of forecasts with respect to observations (as used in four-dimensional variational data assimilation) or those defining some quality of a simulation (such as the strength of some feature). The input data may be initial or boundary conditions or model parameters (such as diffusion coefficients). Applications include such diverse topics as stability analysis, efficient Monte-Carlo forecasting, 4-D variational data assimilation, climate or forecast model parameter specification, synoptic sensitivity analysis and feed-back estimation.

Adjoints were first discussed in meteorological contexts in the Russian literature in the early 1970s. They then appeared in the French and American literature in the early 1980s. In the last 4 years or so, there has been a flurry of activity, mostly in applications to data assimilation. The time and space scales to which adjoints have been applied span minutes (now-casting) to years (climate modeling) and local to global.

At the 9th Conference on Numerical Weather Prediction held in the USA in October 1991, a few researchers involved in adjoint applications decided that adjoint-related work had progressed sufficiently far that a workshop focused on such work should be organized. Its purposes would be to share experiences of problems and results, to acquaint each other with the breadth of applications, to discuss limitations of the technique, and to instruct interested colleagues and students regarding this powerful new modeling tool.

The Workshop on Adjoint Applications in Dynamic Meteorology was held at the Asilomar Conference Center in Pacific Grove, California, USA, 23–28 August 1992. Topics of the workshop included sensitivity analysis, consideration of discontinuous processes, data assimilation, stability analysis, optimal evaluation of model parameters, and Kalman filtering. The participants numbered 75, from 12 nations. Support was provided by the Centre National de Recherche Scientifique (CNRS, France), the National Aeronautics and Space Administration (NASA, USA), the National Center for Atmospheric Research (NCAR, USA), the National Oceanographic and Atmospheric Administration (NOAA, USA) and the National Science Foundation (NSF, USA), with some assistance from the US Naval Postgraduate School and Naval Research Laboratory in Monterey, California, USA. The organizers were Ronald M. Errico (NCAR), Tomislava Vukicevic (NCAR), Philippe Courtier (European Centre for Medium Range Weather Forecasts), John Derber (National Meteorological center, USA), and Jean-Francois Louis (Atmospheric and Environmental Research, Cambridge, Massachusetts, USA).

Several papers which were either presented at the workshop or completed in the subsequent 4 months have been collected in this issue of *Tellus*. All papers have undergone the normal review process. A review of the workshop appeared in the Bulletin of the American Meteorological Society, May 1993. A 2nd workshop is planned for May 1994 in Hungary.

For the co-organizers
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