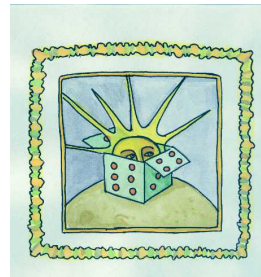


Geophysical Statistics Project at NCAR

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Outline

- NCAR and GSP sketches
- Project accomplishments
- Road map to presentations
- Future plans



National Center for Atmospheric Research



\approx 1000 people total, several hundred Ph. D. scientists

Two main research campuses (Mesa & Foothills)

Half the budget (\approx 60M) is a single grant from NSF-ATM.

Governance is by a consortium of universities (UCAR).

Research programs on most aspects related to the atmosphere

Climate, Weather, the Sun, Ocean/atmosphere, Ecosystems, Economic impacts, Air quality, Instrumentation, Scientific computing and ...

Statistical methods for the geosciences

Major NCAR divisions

- Atmospheric Chemistry (ACD)
- Atmospheric Technology (ATD)
- Advanced Study Program (ASP)
- Climate and Global Dynamics (CGD) → GSP
- Environmental and Societal Impacts Group (ESIG)
- High Altitude Observatory (HAO)
- Mesoscale and Microscale Meteorology (MMM)
- Research Applications Program (RAP)
- Scientific Computing (SCD)

Recently, Initiatives have been created as linked projects that cut across divisional boundaries and have parallel funding.

Mission of GSP

The Geophysical Statistics Project pursues the innovative application and development of statistical methodology to address problems faced in the Earth sciences. A complementary activity is to generalize specific problems in the geophysical sciences to broad based statistical research.

GSP overview

PI's: Rick Katz (ESIG), Joe Tribbia (CGD), Doug Nychka (GSP)

Base Funding: NSF-DMS probability and statistics

Original 7/1993 - 6/1999 4M total

Renewal 7/1999- 6/2004 600K/year

Permanent Staff Project leader, Associate Scientist III (Tim Hoar at 50%), Administrative Assistant (Liz Rothney at 50%).

Postdocs 4-6 recent Statistics PhD's on two year terms

Visitors: Senior sabbatical visitors, local statistics faculty, shorter term visitors, PhD graduate students.

Administration: Housed in Climate and Global Dynamics Division

Oversight and guidance: External advisory panel of statistical researchers and atmospheric scientists. Internal panel of NCAR scientists.

GSP Accomplishments

- Statistical research with application to the geosciences
- Statistics postdoctoral training
- Impact on NCAR and the geosciences
- Enrichments to statistics community
- Strong opportunities for the future

A guide to the presentations

The technical presentations are examples of matching statistical research and modeling with substantive scientific projects.

The topics were also chosen to illustrate GSP's activity at several levels:

- Current GSP post docs
(Bengtsson, Street, Bellone)
- GSP “alumni”
(Tebaldi, Wikle)
- a university- based focus research group
(Berliner, Wikle and Levine)

A guide to the presentations (continued)

Modes of GSP collaborative research within NCAR:

Enlargement of a statistics research area (particle filtering) by tackling a problem in atmospheric science (numerical weather prediction)

Transfer of a general statistical area (observation driven models) to a climate application (temporal models for daily precipitation occurrence)

Application of statistical models (spatial Markov chains) to bridge knowledge between numerical models (large scale dynamics and cloud processes)

Different career paths for GSP post docs:

Project Scientist at NCAR (Tebaldi)

GSP projects lead to a specialization in forecasting.

Tenure track, faculty position (Wikle)

Exposure to Bayes methods formed a basis for research program

Different modes of university involvement:

Long-term collaborations (Berliner)

NCAR/GSP as an integrator for university research (Berliner et al., Workshops)

Short-term visitors and oversight (Smith)

Future plans: Post doc and graduate students

Terms for Bellone, Bengtsson, Oh and Whitcher end late Summer/early Fall

Sarah Streett will continue at 50%

Reinhard Furrer, Swiss Federal Institute of Technology, 9/1/02 -

Jarrett Barber, North Carolina State and Duke Univ. 9/1/02 - at 25%

Tomoko Matsuo, SUNY-Stonybrook and NCAR, (tentative) 1/1/03 - at 50%

Dorin Drigni, Ph. D. student, Iowa State University, 9/1/02- 12/15/02

(Design and analysis of computer experiments, Max Morris adviser)

Uli Schneider, Ph. D. student, CU-Boulder, 7/02

(MCMC and perfect sampling, Jem Corcoran adviser)

Future plans: Some projects

In the near term the challenge is to maintain momentum of projects initiated by the current group of GSP post docs.

NCAR divisions:

Parametrizations for land and cloud processes (CGD)

Classification of variable stars (HAO)

Statistical models of soil parameters (ESIG)

Data assimilation for the upper atmosphere (HAO)

A new project in atmospheric chemistry e.g.

Mixing and Reactive flows (ACD)

NCAR Initiatives:

Uncertainty in climate and weather assessment

Design and analysis of climate change experiments.

Down-scaling of climate model output to local weather

Statistical analysis of climate extremes

Data assimilation

Sequential estimation of parameters for state space models

Adaptive observations

Refinement of particle filters for large dimensional systems

Data Assimilation Research Test Bed (DART)

Variational Methods

Software:

Continued development of R based software, Fields for the analysis of spatial data.

New GSP activities

Thesis-in-residence

Supporting statistics Ph D students to pursue their thesis work at GSP. The goal is to use the residence at NCAR to target geophysical applications in their research.

Statistics Chautauqua

A month long period in the summer where a critical mass of statistics visitors are brought together for informal interactions and seminars.

Interagency agreement with US EPA

Network design and spatial analysis of air quality measurements, coordinating university research efforts.

A Front Range digital department

Coordinating spatial and time series research and courses among CU-Denver, CU-Boulder, CSU and the Colorado School of Mines. Short course development with Los Alamos National Lab Statistics group.