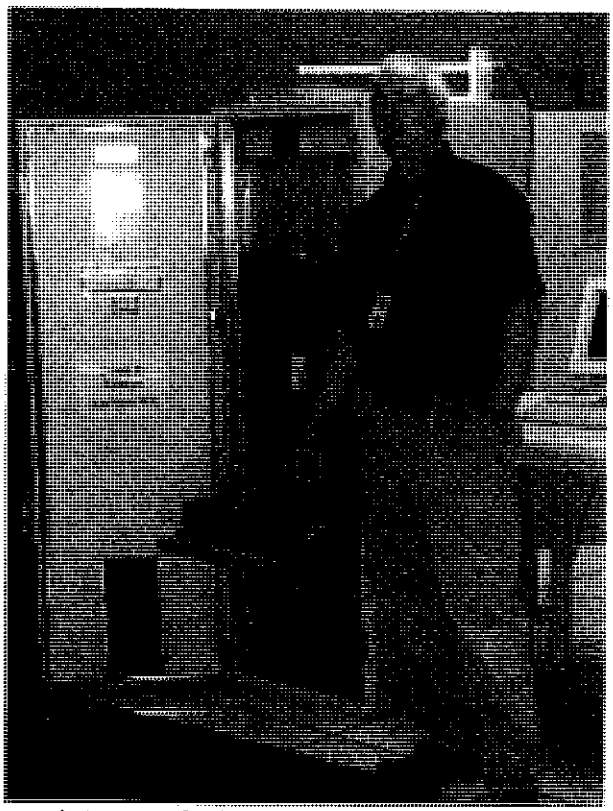
Report from Project Atmosphere 2007

by Sonia Rebellato

Every summer, the American Meteorological Society (AMS) with the support of the National Oceanic and Atmospheric Administration (NOAA) offers a two-week workshop for elementary and secondary school teachers. The workshop entitled Project Atmosphere is designed to prepare peer trainers on atmospheric topics and is hosted at the National Weather Service Training Center in Kansas City, Missouri. The tradition over the years has been to offer one of the 20 coveted spots to a Canadian teacher as selected by the Canadian Meteorological and Oceanographic Society (CMOS) with the support of the Canadian Council for Geographic Education (CCGE). As a geography teacher and co-chair of the Geography Subject Council for the Dufferin-Peel Catholic District School Board, I was honoured to be selected this year.

The AMS staff, including Dr. Geer, presented lessons on various atmospheric topics before sharing educational modules and application ideas that could be used in the classroom. Most remarkable was the number of specialists who travelled to generously share their knowledge with a group of teachers. Field trips supplemented in-class experiences.



Automated Surface Observing System (ASOS)

Sonia Rebellato

Teachers were taught the different components of the Automated Surface Observing Systems (ASOS) which provide the US's primary surface weather observations. Components included the Acquisition Central Unit, the hygrothermometer (temperature/dew point sensor), Laser Beam Ceilometer, freezing rain sensor, and visibility sensor among others. As ASOS updates observations every minute, year round, improved forecasts and warnings are possible.

Daily weather briefings were held to guide teachers in the interpretation of infrared, visible, and water vapour satellite images. As useful as all the technology is, the human component cannot be dismissed. Forecasters know their physical area and can incorporate local effects that computer models miss. Teachers gained a greater appreciation of the knowledge and skill base required for meteorologists.

Mary Glackin, Acting Director of the National Weather Service (NWS), relayed that NOAA's vision begins with an informed society. Approximately 50,000 warnings are issued annually from the 122 weather forecast offices. As a typical year in the US brings 500 deaths, 5, 000 injuries, and $14 billion in losses that are weather-related, there is an increased awareness of the need to be prepared. To improve forecasting in Alaska, Ms. Glackin indicated the region would be bolstered due to increased economic interests and climate change. Tsunami warning centres in Alaska and Hawaii have also seen improvements since the 2004 Indian Ocean tsunami.

Dr. Louis Uccellini, Director NCEP/NWS/NOAA, shared that ¼ of the US economy is weather-sensitive before describing various forecast systems. The North American Ensemble Forecast System sees the sharing of 120 global ensemble forecasts, 40 of them from Canada. Short Range Ensemble Forecasts are used to address winter storms, dry lightning, and precipitation (significant for river flooding). He also indicated there is a demand for 7-day forecasts for extreme events.

Space weather monitoring is becoming increasingly important according to the Director. NOAA has designed Space Weather Scales to report geomagnetic storms, solar radiation storms, and radio blackouts. The increased reliance of the public on communication satellites, whether for GPS navigation data or cell phone conversations, means a greater number of people may be impacted by space weather events. From solar flares to riptides, the NCEP mission truly extends from the sun to the sea.

Dr. Richard Knaff of the Tropical Prediction Center indicated that the El Niño period translates to fewer hurricanes in the Atlantic. While there were only 5 major hurricanes in 1992, Hurricane Andrew still stands out for the costly damage it evoked just south of Miami. As a senior hurricane specialist, Dr. Knaff also described how Hurricane Katrina was a Category 1 over Florida before tapping into the Gulf waters and turning into a Category 5. Most fatalities attributed to Hurricane Katrina were due to storm surges. Dr. Knaff indicated the Center utilizes computer forecasts, dropwindsondes, and C130 planes. Partnerships with other countries are important. Based on the case of a 1938 storm, a hurricane on Puerto Rico could hit New York in 24 hours. Hurricanes that move north typically accelerate, a fact not lost on the Atlantic provinces.

Ron Przybylinski of the St. Louis NWS Office provided an overview of radar theory, supercell storms and bow echoes. He outlined a plan to put Doppler radar on cell towers. Additionally, two case studies, the Evansville, Indiana tornado (November 2005), and the tornado outbreak over Missouri (March 12, 2006) were highlighted. He described the enhanced Fujita Scale and displayed reference pictures used in determining the F-scale based on damage characteristics.

The Aviation Weather Center (AWC) in Kansas City, Missouri, provides aviation warnings and forecasts of hazardous flight conditions (turbulence, thunderstorm, icing, and volcanic ash). The forecasts for thunderstorms, the Collaborative Convective Forecast Product, (CCFP), are the result of the combined efforts of meteorologists from commercial airlines, the FAA's System Command Center, the AWC, and the Meteorogical Service of Canada. Meteorologists at the 8 forecast desks (3 for the contiguous US, 2 for thunderstorms, and 3 for international) demonstrated their duties at the desk. It was impressive to see the number of aircraft on computer screens that were benefiting from the work of 8 intrepid meteorologists.

Up, Up and Away!

Launch of a Weather Balloon

Arrangements were made for the group to visit the Topeka NWS office and witness a radiosonde launch. The balloon-borne instrument package relays back data regarding temperature, air pressure and relative humidity. (One instructor reminisced about searching for Canadian radiosondes because their unique humidity sensor used a human hair to measure fluctuations.) The Topeka ground station is one of hundreds around the globe that launch a radiosonde simultaneously twice a day at 0000 GMT and 1200 GMT in order to capture a synoptic view of the weather. Each launch is estimated to cost $100 (US). The package, attached to the balloon basically by kite string, reaches 100,000 feet within 100 minutes, where it frequently breaks off. The Topeka site reports 25% of their radiosondes are returned.

The Topeka Ground Station

Overall, Project Atmosphere offered a first-rate learning experience that included extensive technology, but more importantly highlighted the spirit of co-operation and commitment amongst those who work in the atmospheric sciences. I am thankful to the CMOS and the CCGE for this invaluable professional development opportunity and look forward to sharing it with my colleagues.

A-O Abstract Preview

Avant Première des résumés de A-O

The following abstract will soon be published in your ATMOSPHERE-OCEAN publication.

Le résumé suivant paraîtra sous peu dans votre revue ATMOSPHERE-OCEAN.

Climatic Influences on Markovian Transition Matrices for Vancouver Daily Rainfall Occurrence

SEAN W. FLEMING
e-mail: fleming_sean@hotmail.com

Abstract
Two-state, first-order, single-site Markov models for daily precipitation occurrence were developed for each winter rainy season over the historical period of record at five long-term meteorological stations in the lower Fraser Valley of British Columbia, Canada. Monotonic temporal trends in the independent elements of the transition matrices were then assessed. Although the results remain tentative, there is some evidence for a regionally coherent long-term negative trend in the probability of wet-to-dry state transitions, P_{10} (or a positive trend in the probability of a wet day being followed by another wet day, P_{11}). In contrast, there is no evidence for a regionally coordinated and consistent trend in the probability of dry-to-wet state transitions, P_{01} (or, therefore, in the probability of a dry day being followed by another dry day, P_{00}). These results appear loosely consistent with previous statistical climate change impact studies in the region, and might be physically interpreted as suggesting a gradual increase in the local typical duration of a Pacific frontal storm during hydrologic winter, with no systematic trend in the average duration of a dry-day interlude. Additionally, the probability of any day-to-day precipitation state transition (from wet to dry, or from dry to wet), P_{ST}, has been tentatively interpreted to exhibit an area-wide negative long-term trend, suggesting an overall increase in precipitation memory. The findings provide some additional regional context for several issues in hydrometeorological modelling, climatology, and environmental impact assessment.

Résumé
Nous avons mis au point des modèles de Markov du premier ordre à deux états pour un seul site pour l'occurrence des précipitations quotidiennes pour chaque saison de pluies hivernales durant la période historique de relevés à cinq stations météorologiques à long terme dans la vallée du bas Fraser de la Colombie-Britannique, au Canada. Nous avons ensuite évalué les tendances temporelles monotones dans les éléments indépendants des matrices de transitions. Bien que les résultats demeurent préliminaires, il y a des indices d'une tendance négative à long terme cohérente à l'échelle de la région dans la probabilité des transitions de l'état humide à l'état sec, P_{10} (ou une tendance positive dans la probabilité qu'un jour humide soit suivi d'un autre jour humide, P_{11}). En revanche, on ne trouve pas d'indice d'une tendance coordonnée et cohérente à l'échelle régionale dans la probabilité des transitions de l'état sec à l'état humide, P_{01} (ou, par conséquent, dans la probabilité d'un jour sec suivi d'un autre jour sec, P_{00}). Ces résultats semblent s'accorder jusqu'à un certain point avec des études statistiques précédentes sur les répercussions du changement climatique dans la région et pourraient physiquement s'interpréter comme suggérant une hausse graduelle dans la durée caractéristique locale d'une dépression frontale du Pacifique durant l'hiver hydrologique, sans tendance systématique dans la durée moyenne d'un intermède de jours secs. De plus, la probabilité d'une transition d'état de précipitations quelconque (d'humide à sec ou de sec à humide) d'un jour donné au jour suivant, $P_{TÉ}$, a été provisoirement interprétée comme affichant une tendance négative à long terme dans l'ensemble de la région, ce qui suggère une augmentation générale durant la période de données de précipitations. Les résultats fournissent un certain contexte régional supplémentaire pour plusieurs problèmes de modélisation hydrométéorologique, de climatologie et d'évaluation des conséquences environnementales.

Request for comments on a proposal:

A Research Consortium in Atmospheric and Related Sciences

Text in italics prepared by Paul Myers, CMOS President 2007-08, pmyers@ualberta.ca

Recently some discussion has been held about the possibility of forming a research corporation in atmospheric (and related) sciences, based upon the model of UCAR in the United States. Following a discussion at the past CMOS congress in St. John's, Charles Lin of Environment Canada forwarded a short discussion paper on this idea to CMOS, asking for comments. CMOS has posted this document on its web site, asking for comments from members so that the society executive can provide an informed choice.

I view ocean sciences as a related discipline to atmospheric sciences and thus would hope that if anything comes out of these discussions, oceanography is also involved. I would urge readers of the CMOS Bulletin SCMO