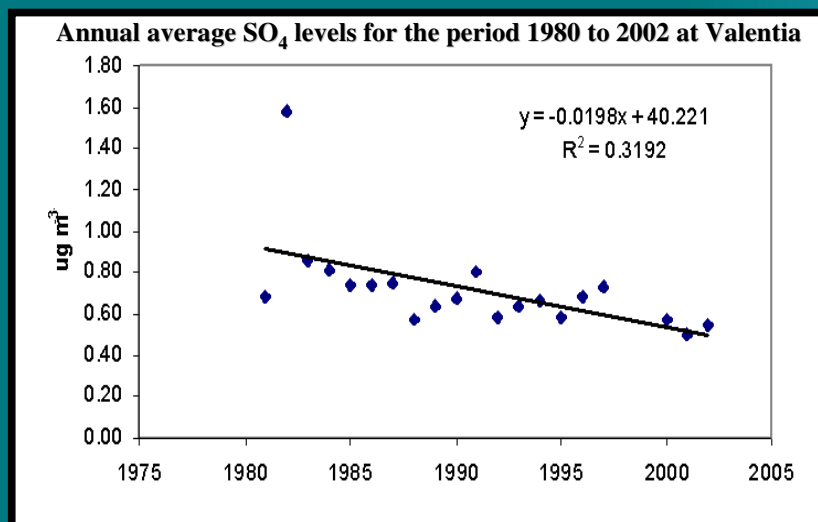
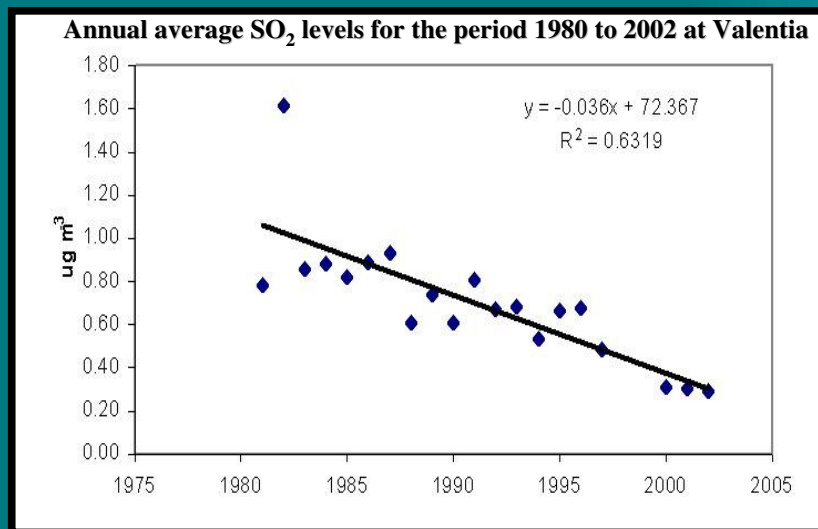


**Transboundary Air Pollution – National
Coordination Meeting
Gresham Hotel – Dublin
Thursday, November 19th**

**Met Éireann – Air Pollution Monitoring and
Modelling
Eoin Sherlock**

Contents

- Transboundary pollution
- Air and precipitation monitoring network
- WMO GAW Program: stations
- EMEP monitoring stations
- Chemical analysis laboratory – Met HQ
- Modelling activities
- CCRP fellowship
- Operational air quality forecasts & issues

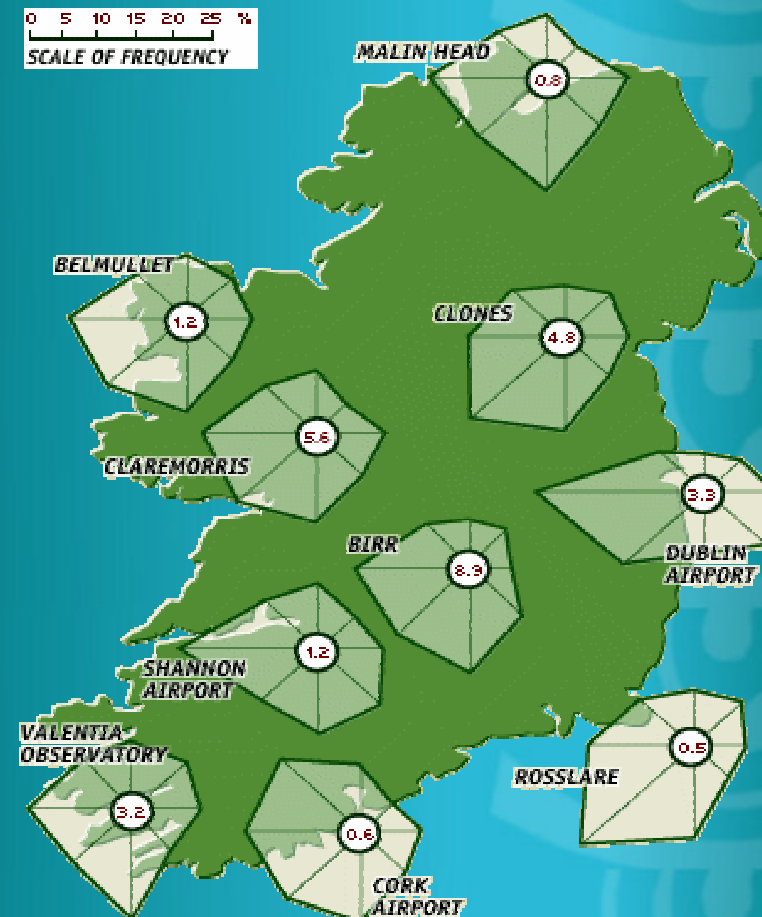


From Bashir and McGovern 2004

- ***Convention on Long-range Transboundary Air Pollution (CLRTAP) – 1979:*** intended to protect the environment against air pollution and to reduce and prevent air pollution, including long-range transboundary air pollution.
- **SO₂ and SO₄ since 1981 – Valentia** most extensive record in Ireland.
- **NO₂ since 1989 – Valentia** most extensive record in Ireland
- **Important** because of impact of acidifying species on ecosystems
- **Success of international emissions reductions actions** in relation to ambient levels of sulphur species.

Wind roses for met stations

- Wind rose plots for a number of synoptic stations
- Calculated for the standard climate period of 1961 – 1990
- Inner circle value is the percentage of time when it was calm



Air & Precipitation Chemistry Monitoring

- GAW: Global Atmospheric Watch
- EMEP: European Monitoring & Evaluation Programme
- EPA
- NUI Galway
- Chemical Analysis, Glasnevin

WMO: Global Atmospheric Watch Program

- GAW - is a partnership of 80 countries which provides reliable scientific data and information on the chemical composition of the atmosphere, its natural and anthropogenic change, and helps to improve the understanding of interactions between the atmosphere, the oceans and the biosphere..
- Main Objective: Long-term atmospheric monitoring on a Global scale.
- Two types of GAW stations
 - Global
 - Regional

GAW: Stations

- Global stations
 - Complete range of measurements relating to climate change, atmospheric ozone changes and other global-scale environmental issues.
 - Located in remote areas where no significant changes are expected to the surroundings over the long term.

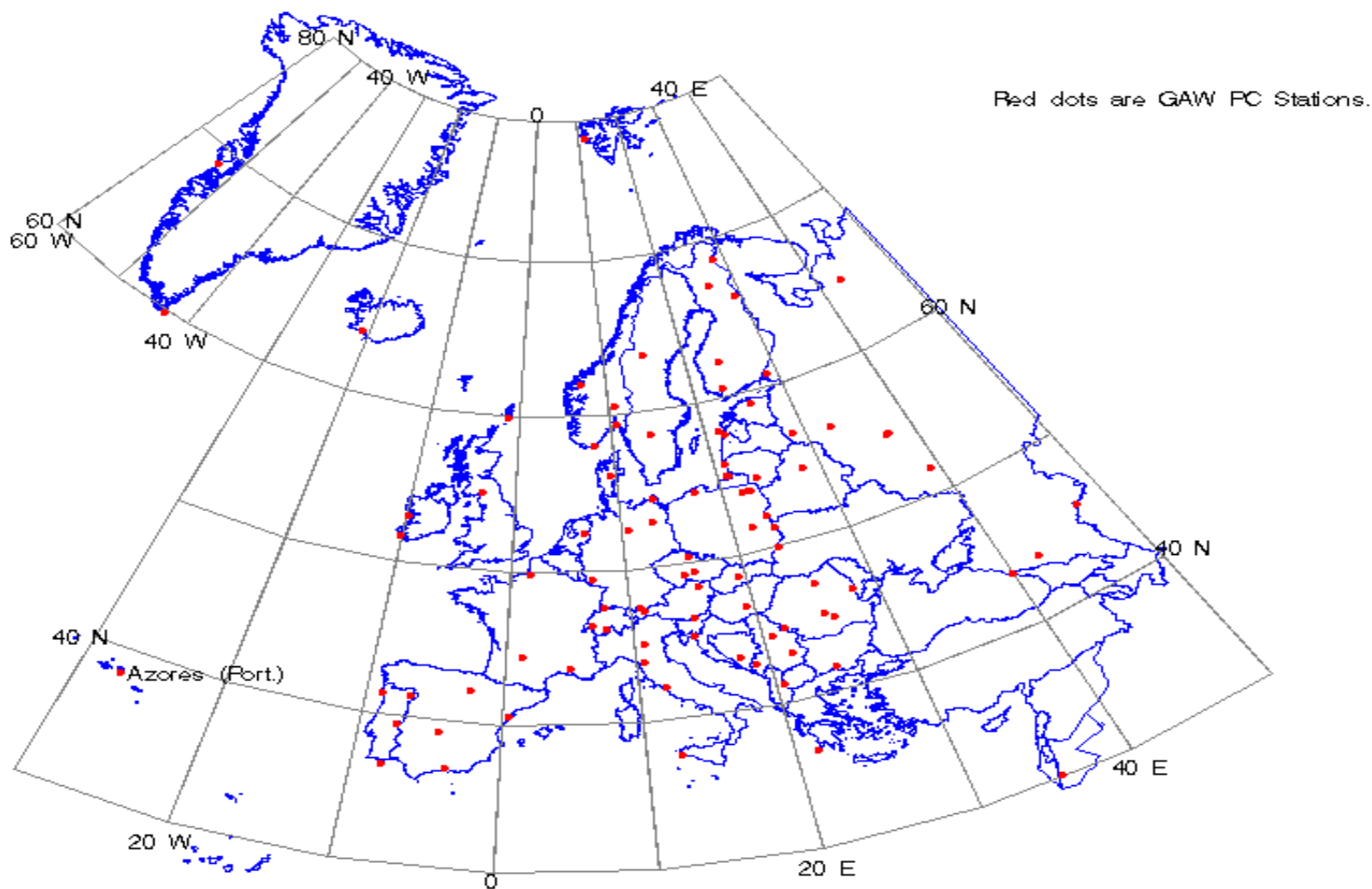


Neumayer   South Pole

GAW: Stations II

- Regional Stations
 - Narrower range of observations than Global stations.
 - Concerned with regional environmental problems such as acid rain, rural air pollution and ecosystem deterioration.
 - Located in areas representative of surrounding region.

Region 6 Precipitation Chemistry Stations



EMEP

- European Monitoring and Evaluation Programme under the UNECE Convention on Long-Range Transboundary Air Pollution
- Co Operative Programme for the Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
- The Norwegian Institute for Air Research is the Chemical Co-coordinating centre for EMEP.
- EMEP is part of the framework for international law dealing with the problem of transboundary air pollution.

GAW & EMEP Stations

- Existing stations pre '06:
 - Valentia
 - Mace Head
- Stations since '06:
 - Carnsore Point (EPA),
 - Wexford (EPA),
 - Oak Park (Teagasc),
 - Glenn Veagh (NPWS)
 - Malin Head (Met Éireann)



EMEP Stations: Monitoring

- **Air Monitoring:**

EMEP: NO_2-N (Nitrite) – using *NaI* impregnated filters – daily measurements

EMEP: SO_2-S and SO_4-S – using *KOH* (Potassium hydroxide) impregnated and standard filters – daily measurements

- **Rainwater Sampling:**

EMEP : Na^+ , Ca^+ , K^+ , Mg^+ , NH_4-N (Ammoniacal-Nitrogen), Cl^- , NO_3-N (Nitrate), SO_4-S , Conductivity – daily

Met Éireann: SO_4 and SO_2 Sampling

- SO_4 and SO_2 are sampled using a two-stage filter system.
- Plain Whatman 40 ashless filter paper is used to collect SO_4 .
- An alkaline filter paper is used to collect SO_2 .

Met Éireann: NO₂ Sampling

- NO₂ Sampling is done using sodium iodide impregnated glass-sinters to absorb nitrogen dioxide.
- Until Jan 2002, it was done using the TGA-Ansa absorption solution method.

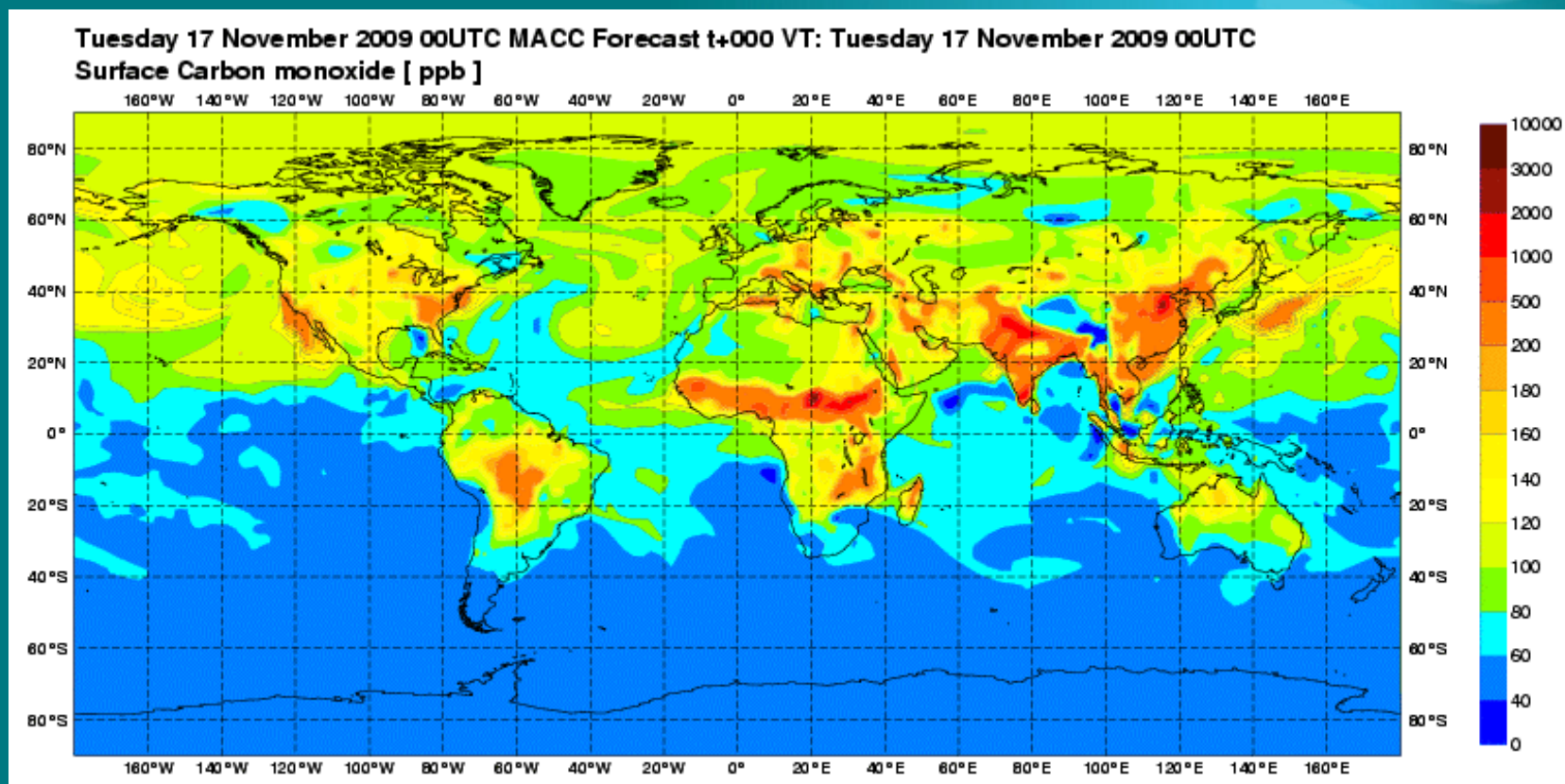
Met Éireann: Air Pollution Modelling

- Met Éireann is involved with the EPA CCRP (Climate Change Research Programme) fellowship; Transboundary Air Pollution with NUIG (C. O'Dowd, S. Varghese)
- NUIG will develop a system based around the REMOTE model (a regional scale atmospheric climate-chemistry/aerosol model). There will be ongoing development throughout the fellowship
- It will ultimately be used to produce an operational system
- It will take boundary data from MACC (formerly GEMS)

Air Pollution Modelling: II

- MACC: Monitoring Atmospheric Composition & Climate; monitors the composition of the atmosphere in near-real-time by assimilating observations of various meteorological variables as well as reactive gases and aerosols into its data assimilation system.
- The observations are used to constrain a computer model that describes the state of the atmosphere at any one moment.
- MACC took over from GEMS in June '09: Global and regional Earth-system (Atmosphere) Monitoring using Satellite and in-situ data (GEMS)

MACC real-time fields for; CO/ppb



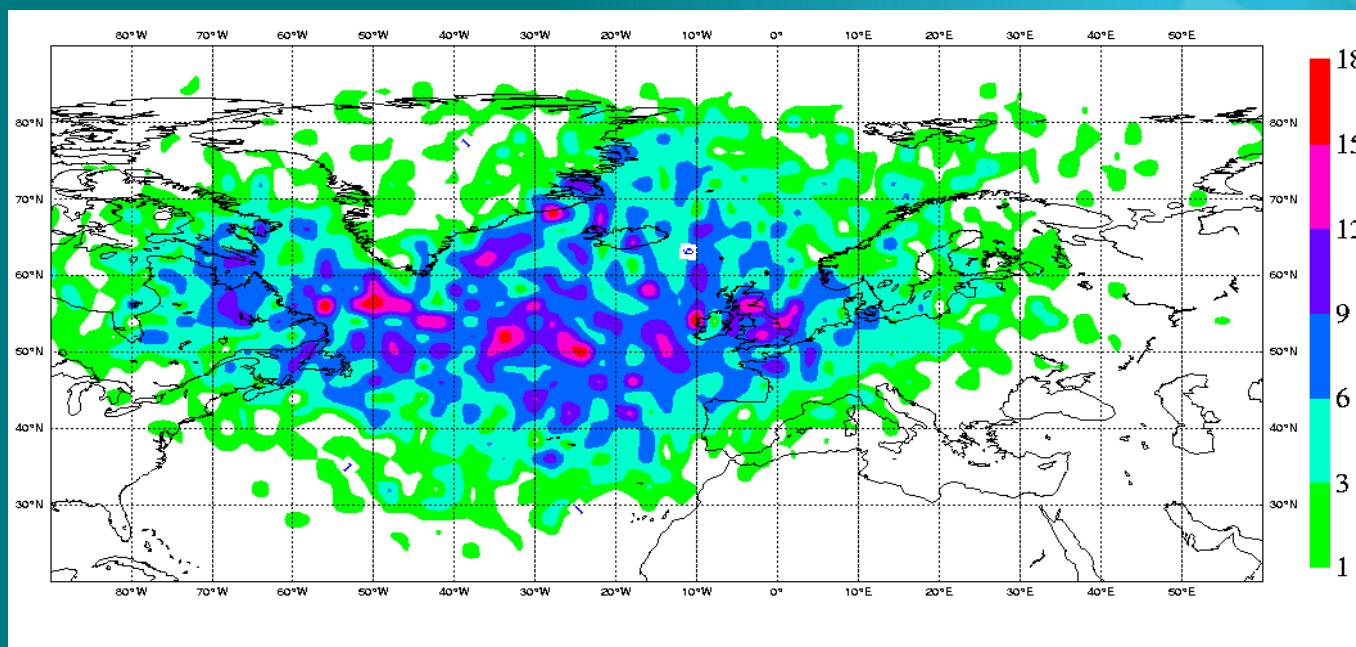
Operational Air Quality Model

- MÉ has vast experience with operational systems; an ocean model used in the C4I (Community Climate Change Consortium for Ireland) project has been incorporated into our operational suite
- This transition from scientific idea to operational status was not straight-forward
- It involves the merging of scientific knowledge of the model with a technical skill set as well as operational requirements.
- This is a daunting task as MÉ research and application staff are predominantly concerned with the atmospheric side of things

Future flow patterns

- The future state of the atmosphere and climate will be investigated with data from the EC-EARTH project (Earth system with atmosphere/ocean/sea-ice/land/atmospheric chemistry model (TM5 3D atmospheric chemistry-transport ZOOM model))
- Where does our air originate from?
- If the flow patterns are changing what are the implications for air quality in Ireland?
- As we know at present transboundary pollution occurs when easterly winds arrive over Ireland.
- How will this change in the future?

Back-trajectories from Ireland



5-day 3D atmospheric back-trajectories (start points), 1985-1999, arriving at Dublin (at 10m level). Shading indicates numbers in each $2^\circ \times 2^\circ$ box (right legend).

Looking to the future / Issues

- Looking ahead:
 - Who will the forecast information be given to?
 - The EPA, the general public?
 - How will the information be distributed?
 - TV and radio forecasts, print media, the web?
 - Who will provide the support for the monitoring of the forecasts?
 - ME is primarily involved with the atmosphere
 - Economic environment/staffing issues