

Air quality trend analysis and mapping for Scotland



Scottish Executive

Paul Willis, March 2006



Topics covered in this talk

- Introduction.
- Existing Information.
- Air Quality Trends Analysis for Scotland.
- Mapping Air Quality in Scotland.





Introduction to mapping and trends

- This work has been commissioned by the Scottish Executive – Why?
- UK Trends and maps may not be accurate for Scotland.
- Citizens and policy-makers in Scotland need to know:
 - Is air quality improving?
 - Which areas are the worst?



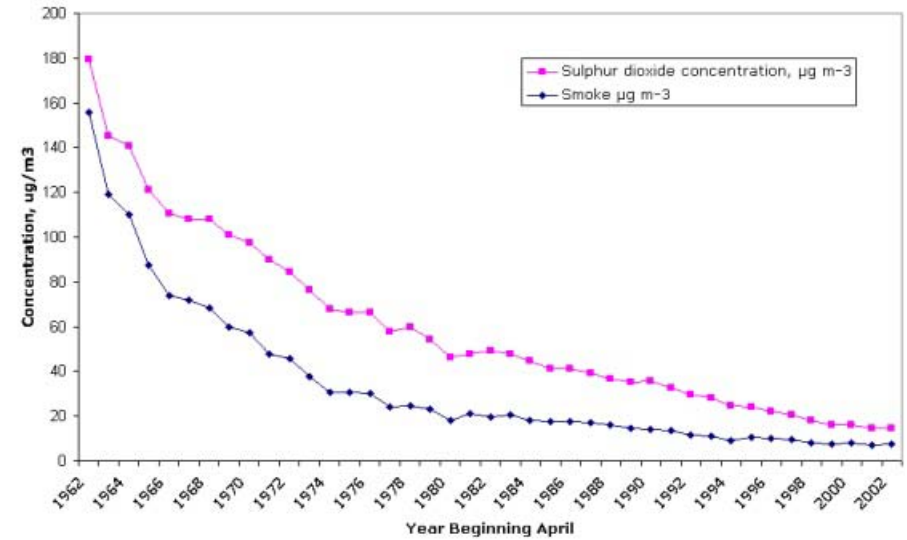
Existing On-line Information



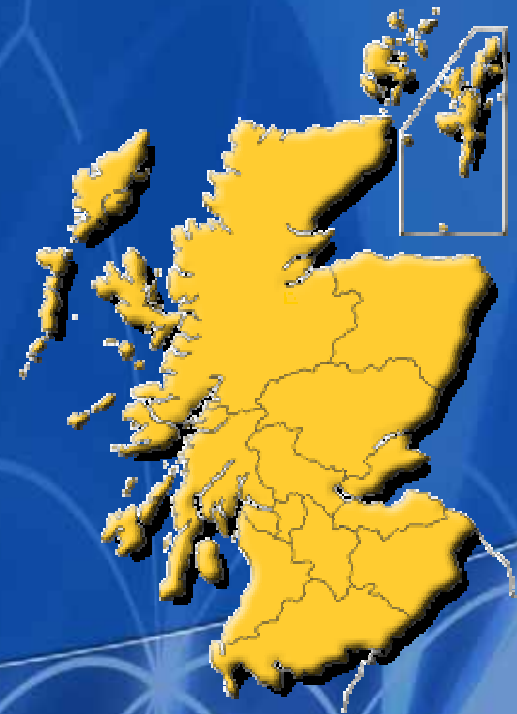
- At the UK level, the following air quality trends data are already published:
 - Headline Air Quality Indicator.
 - Sustainable Air Quality Indicators.
- Local Authorities may also publish their own indicators from local data, based on UK methodology.
- The following mapped air quality information is also available:
 - UK Background Concentration Maps.
 - UK Road Links Maps.
 - UK Emissions Maps.
 - LAQM maps including AQMA's where declared.

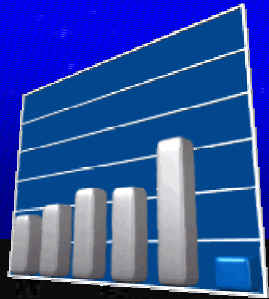


Smoke and SO₂: long term trends over 40 years in Annual Average Levels



Air Quality Trends Analysis for Scotland

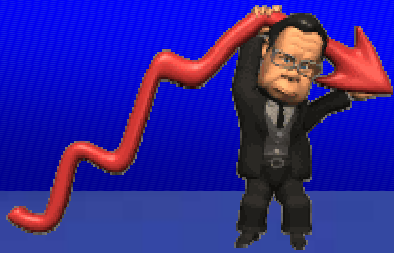




Trends Analysis – What is it?

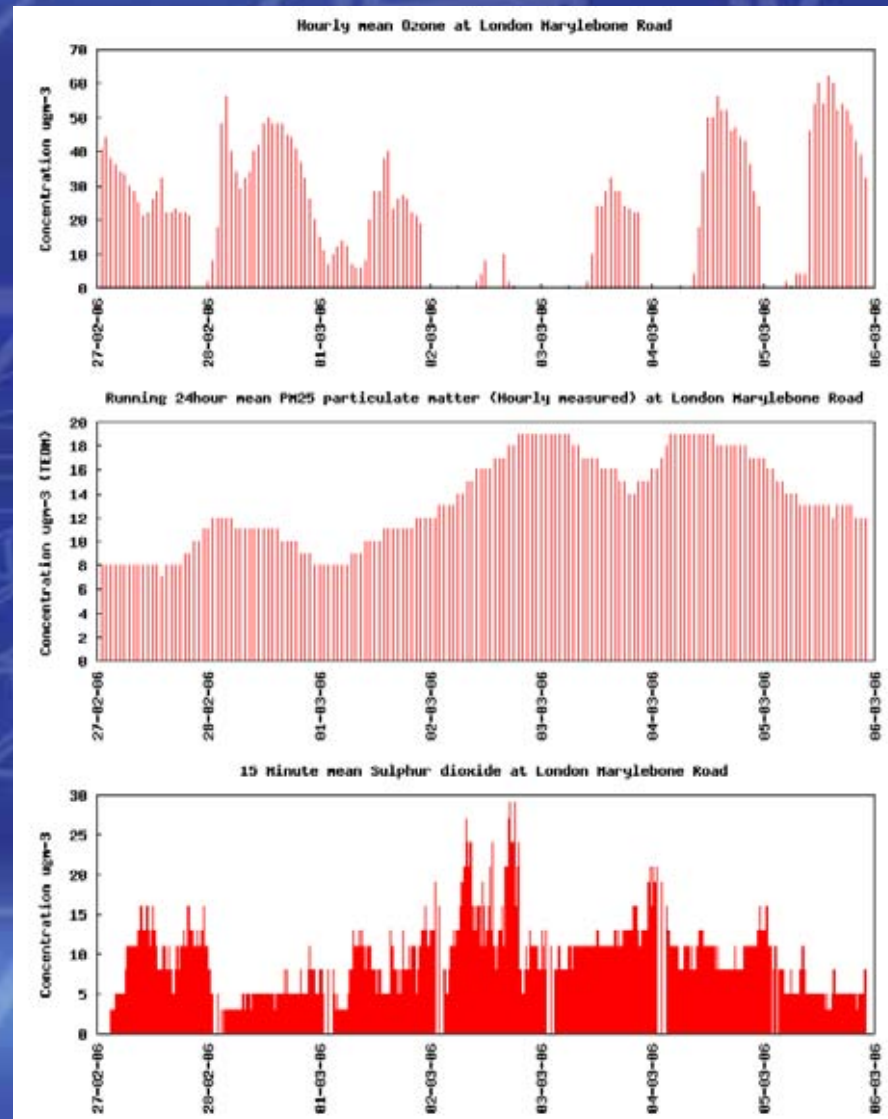
- Short-term trends over a period of hours, weeks or months.
- Long-term trends over many years.
- Individual sites or the average from a “basket” of selected sites.





Hourly Time-series Graphs

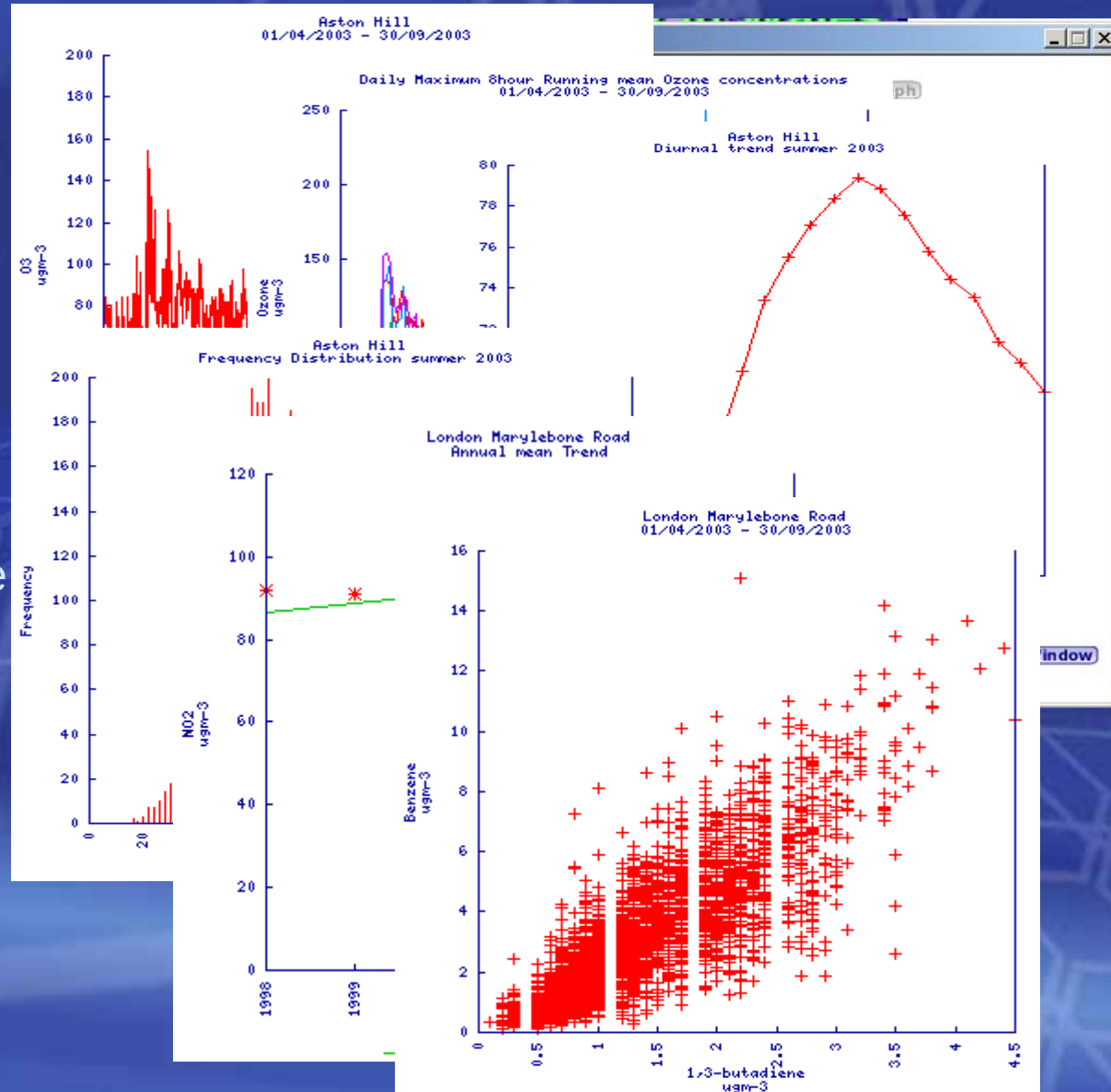
- The UK Air Quality Archive provides very simple pre-prepared time-series graphs of trends in weekly pollution levels for each monitoring site.
- The graphs show data averaged appropriately for comparison with relevant health-based air quality standards.
- This is functional but not very useful for comparing between different sites or over different periods.





More Advanced Graphs

- The Pilot Scottish database will provide pre-prepared neater time-series graphs of all pollutants at each site for one week or one month.
- Other selectable graphs could be provided on line in the future - including:
 - Timeseries.
 - Diurnal.
 - Frequency Distribution.
 - Trends.
 - Regressions.





Key Air Quality Indicators

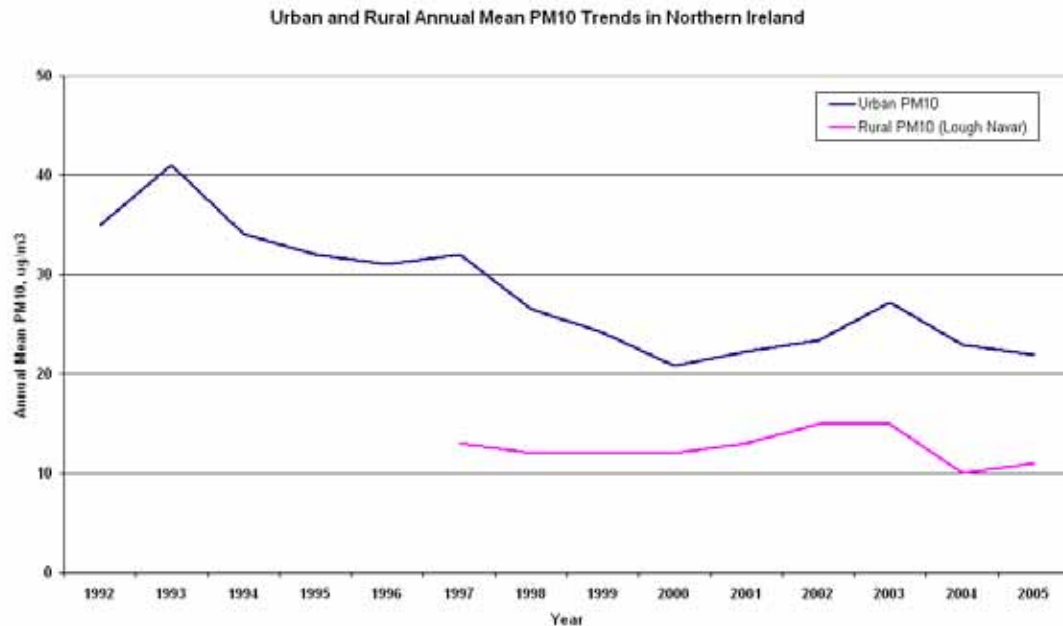
- These are based on long-term trends.
- They are critical for:
 - Informing the public about how air quality is changing.
 - Understanding the impact of emissions, weather and policies.
- As part of this project, we will be looking specifically at developing air quality indicators for Scotland.



How...

- Calculate “Headline Indicator” of number of Moderate or worse air pollution episodes using AURN sites in Scotland + any other long-term data available
 - 75% Minimum Annual Data Capture.
 - Calculate for Rural and Urban locations.
- Examine long-term trends from:
 - NO₂ diffusion tube monitoring (Background and Roadside).
 - Automatic NO₂ and PM₁₀ monitors.
- Careful review will be required to determine whether the number of sites is sufficient to determine a robust trend.

Examples- Recently Calculated for Northern Ireland

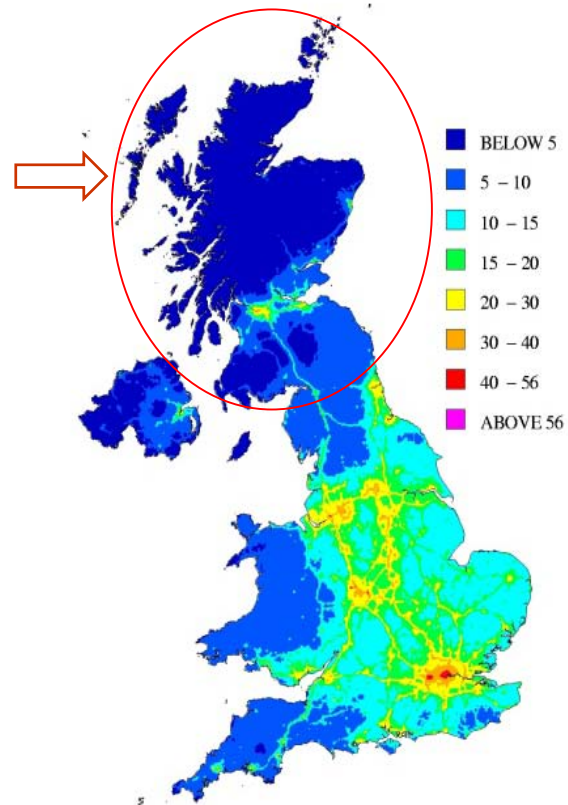


- Headline Indicator.
- Annual trends:
 - Diffusion Tubes.
 - Automatic NO₂.
 - Automatic PM₁₀.
 - Ozone?

- Some sites may be included despite low data capture if it preserves the trend. Expert judgement will need to be taken in these cases.



Mapping Air Quality in Scotland





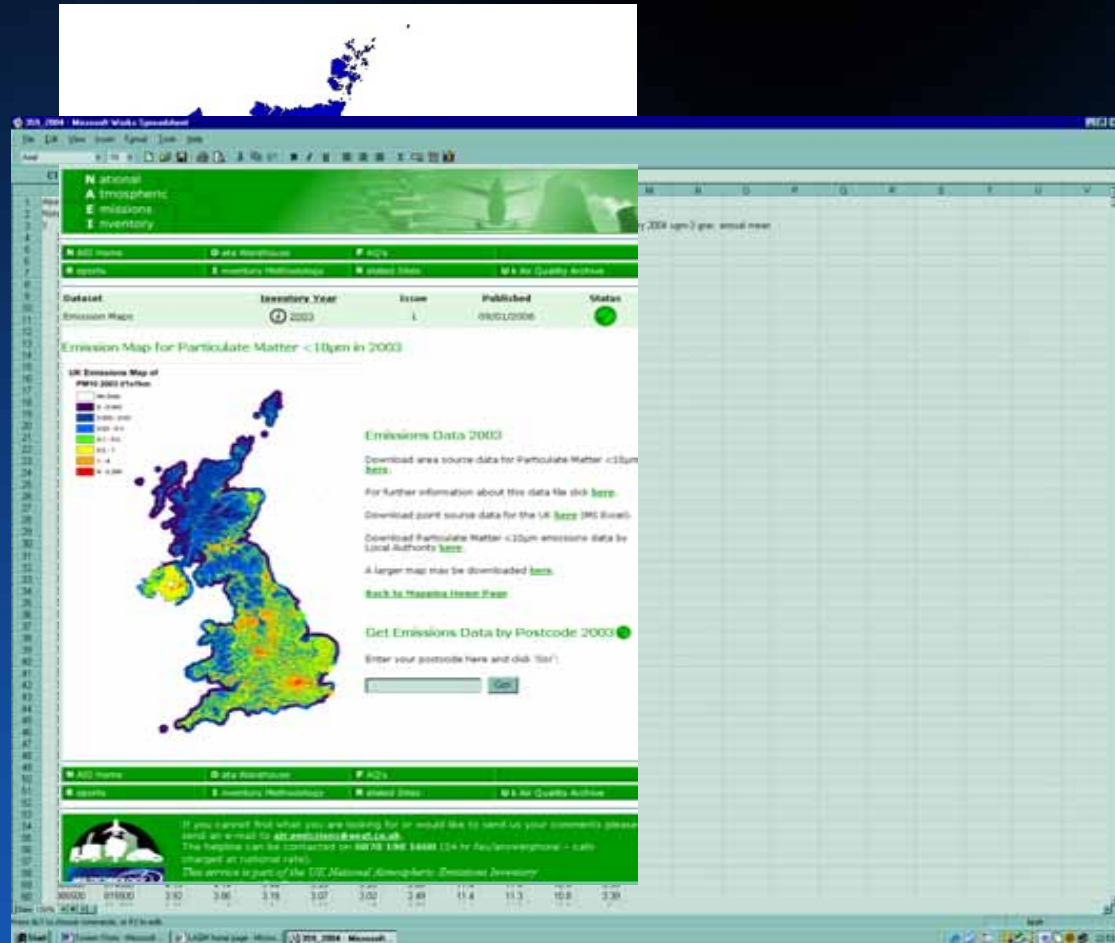
Mapped Data – What is it?

- Mapped data can be provided on-line as:
 - Graphics.
 - Grid data selectable by “click” or drop-down menu.
 - Full mapped data set from data warehouse.



Examples of UK mapped data on-line

- Modelled background concentration maps.
- Downloadable grid data.
- Compiled emissions inventory maps.
- Data by postcode





Background Air Quality Maps

- These are derived by Netcen from emissions data and monitoring results.
- They are key for:
 - Clearly showing the spatial distribution of pollutants across large areas.
 - Review and Assessment. An accurate background is essential.
- As part of this project, we will be looking specifically at developing the background air quality maps for Scotland.

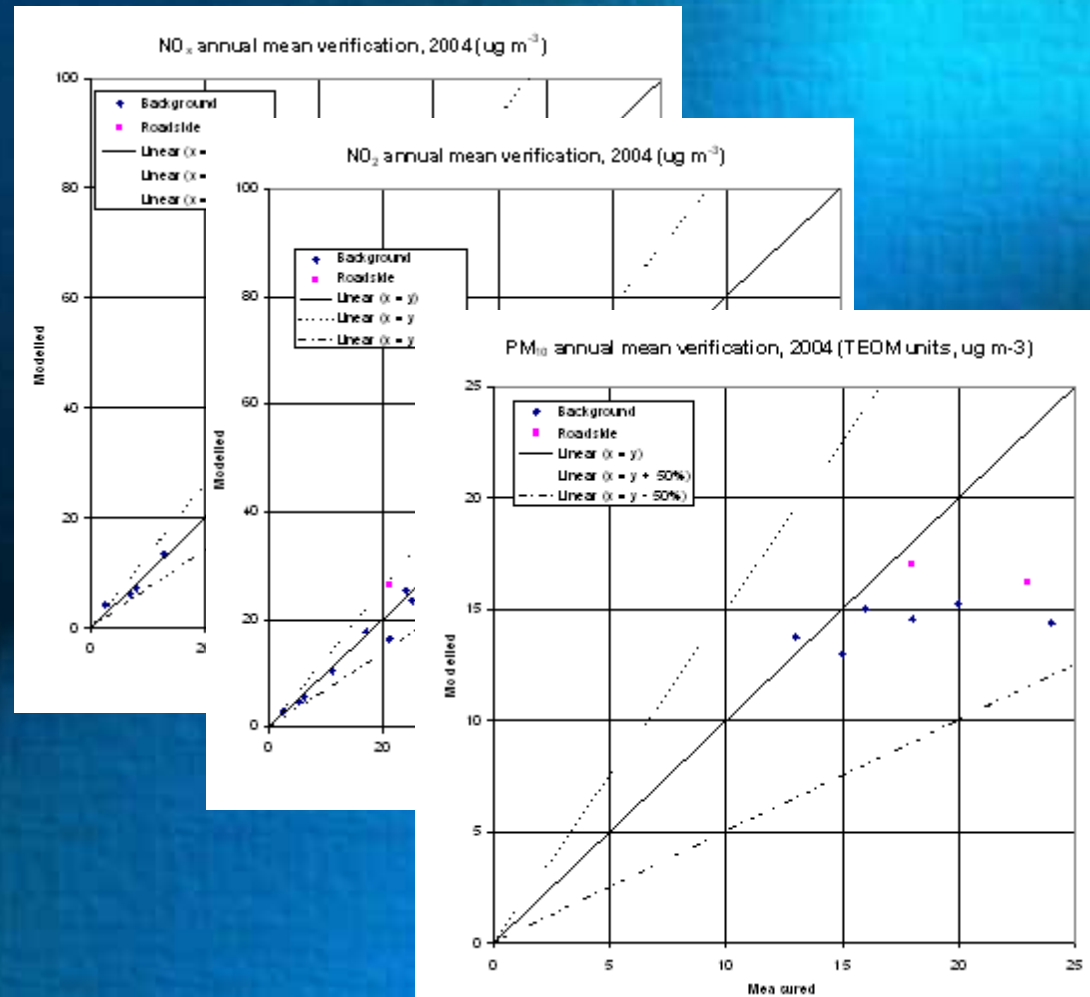
How will we do this?



- The work will be in two stages.
 - The existing Scottish data from the UK mapping will be validated solely against Scottish Monitoring Data to see how well it fits.
 - A new improved mapping kernel will be developed for Scotland from the Pilot Study Database.

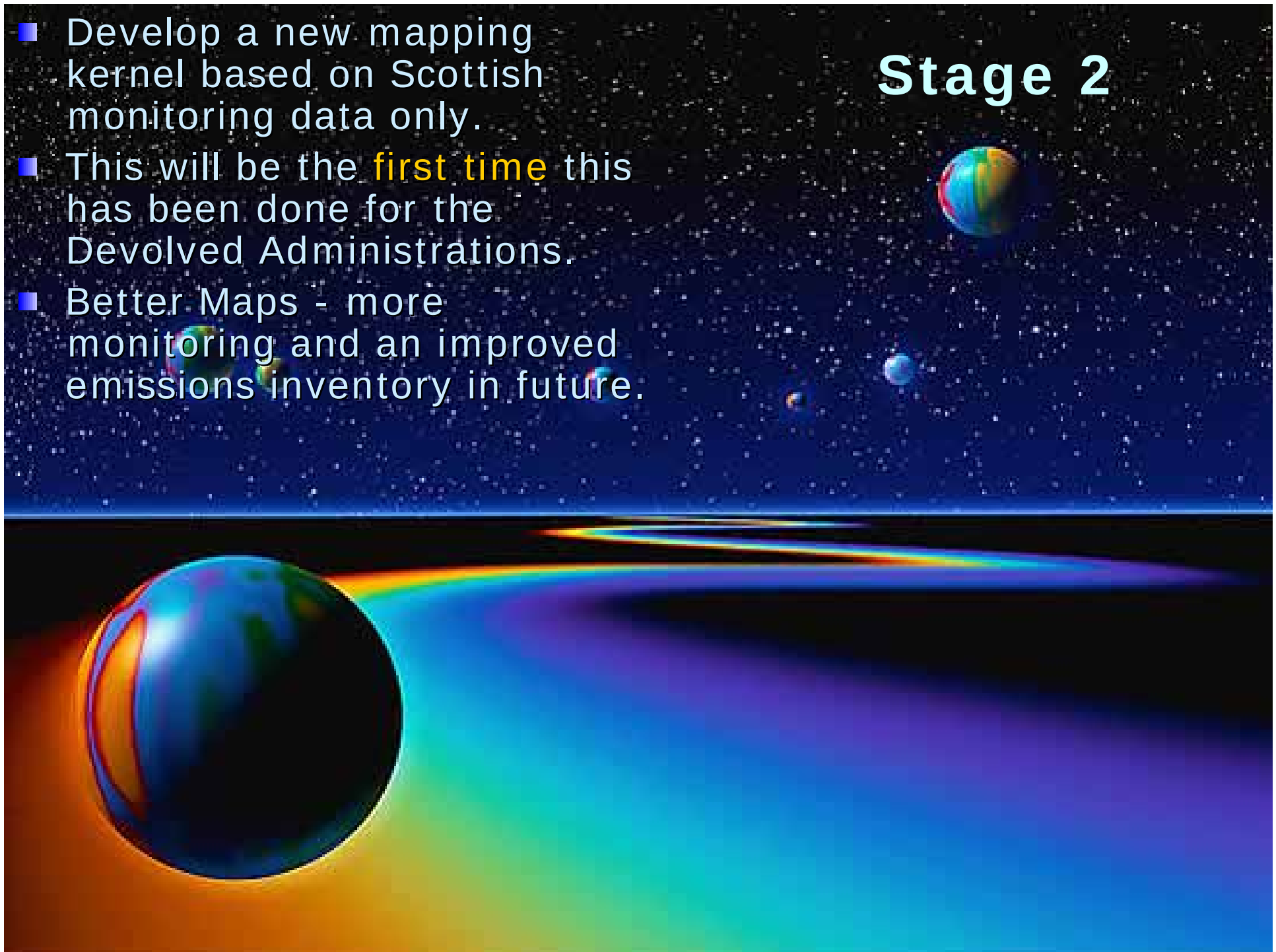
Stage 1

- Extract background data for relevant grid squares in Scotland.
- Compare with measured data in the database by use of linear regression.
- Assess accuracy and likely sources of error.
- Report.



Stage 2

- Develop a new mapping kernel based on Scottish monitoring data only.
- This will be the **first time** this has been done for the Devolved Administrations.
- Better Maps - more monitoring and an improved emissions inventory in future.



**Thank you-
any questions?**

