

Increasing the value of meteorological data

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With thanks to: Stephan Siemen, Sándor Kertész, Iain Russell

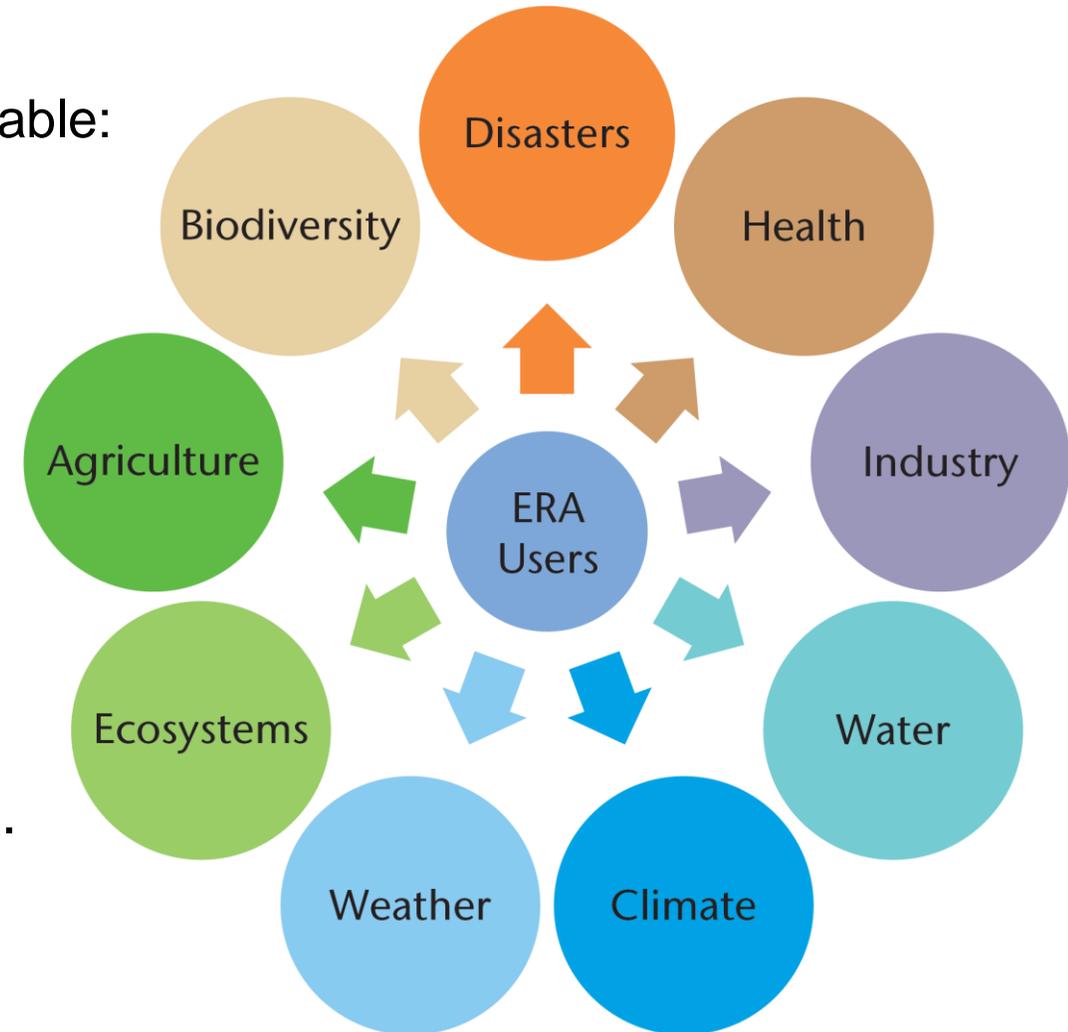
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Meteorological data services

- There is a **vast amount of meteorological data** available:
 - from a wide range of providers
 - going to a wide range of stakeholders
 - including observed data, model and derived products
- This talk will focus on some aspects of scientific use of meteorological data.
- Consider some **use cases** of how use of met data can be enhanced for scientific **research and teaching**.



Reanalysis data

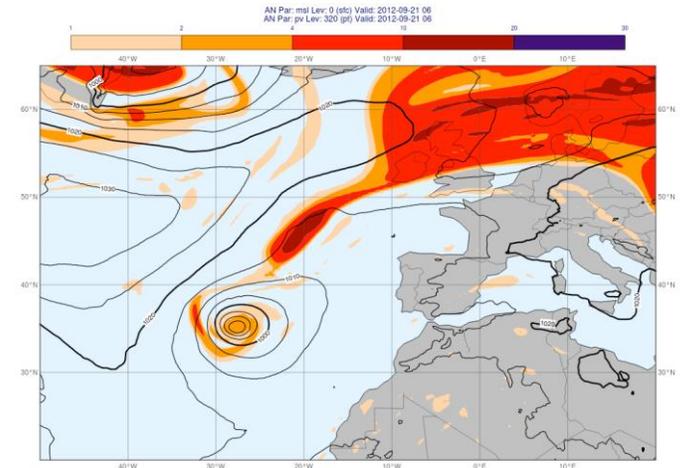
- ECMWF **reanalyses** have increased in **number**, **scope** and **quality**.
- Reanalyses are **popular** datasets:
 - over 5m fields retrieved daily.
 - many peer-reviewed scientific articles use them.
- Some possible **limitations**:
 - **knowledge** of data production / definitions.
 - awareness of **model formulation** (e.g. Interim/Land).
 - asking **appropriate** questions.

Dataset	Archive	Time period
ERA-Interim	Download	1979-present
ERA-Interim/Land	Download	1979-2010
CERA-20C	Download	1901-2010
ERA-20CM	Download	1900-2010
ERA-20C	Download	1900-2010
ERA-20CL	Expected soon...	1900-2010
ERA-40	Download	1957-2002
ERA-15	Download	1979-1993
ORAS4	Download ⇨	1958-2015
ORAP5	Download ⇨	1979-2013
ORAS5	Expected soon...	



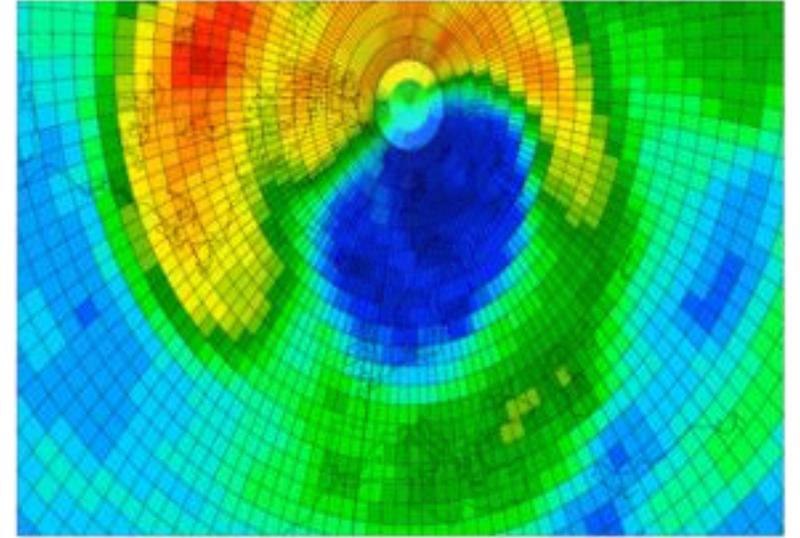
Realizing added value

- **Provide same models / tools** used to create the reanalyses.
- **ECMWF OpenIFS**
 - Release select versions of **IFS for research and education**.
 - **Same forecast capability** but without any data assimilation.
- OpenIFS will release **same IFS** version used to create **ERA-5**
 - Researchers will have ability to combine model & data.
- OpenIFS also **promotes** use of **ECMWF tools** such as Metview
 - Regular user workshops for training & user engagement.



Use case 1: Atmospheric composition modelling

- U. Oslo – offline atmospheric chemistry/aerosol modelling
- Combines **reanalysis with OpenIFS** to drive offline model.



ERA-Interim used to initialise 36hr T159L60 OpenIFS forecasts

Modified OpenIFS outputs additional convective fields as well as winds, temperature etc..

Offline chemical transport model uses OpenIFS 3hrly forecast fields as forcing meteorology

Use case 2: Using virtual environments for training

- Providing **portable, complex ESM** models can be a challenge in a teaching environment.
- **Virtual machines (VM)** offer a solution:
 - Highly portable, tested and bespoke computing environment.
 - Ideal for teaching particularly in remote classroom/workshops.
 - OpenIFS/Metview training workshops used custom VMs successfully for number of years.
- **WWRP/WCRP: Polar prediction workshop: Abisko, Sweden**
 - **Combined** theory, field meteorology and modelling exercises.
 - VM provided a **uniform teaching environment** with all the met data, models and tools ready to use.
 - Students were able to collect data and run experiments using the OpenIFS single column model driven by met data.



For more information: BAMS DOI: <http://dx.doi.org/10.1175/BAMS-D-16-0119.1>

Future

- Providing the **model used for the reanalysis** adds value by allowing researchers to:
 - Understand model sensitivities and performance.
 - Access more fields at higher temporal/spatial resolution.
- Will see more applications of **combined reanalysis data and model** with ERA5
 - Adds to increasing amount of openly available data for research.
- Growth of **cloud based and virtualized platforms** for deployment of models and data research activities
 - WRF Cloud services are quite mature.
 - Others developing in research/education sector (e.g. CloudMUSC for Nordic countries).
- OpenIFS will **leverage future developments** in MetviewPy / Met.3D.