

New Interpolation Package

MIR

Meteorological Interpolation and Regridding

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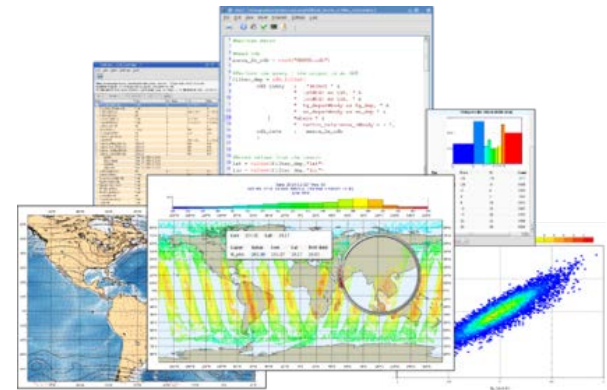
Development Section, Data Handling Team

Introduction

- **Interpolation and regridding software crucial to ECMWF**

- Required by many software packages such as

- **Product Generation**
- **Metview workstation**
- **MARS archive**



- **Interpolation *expertise* is crucial to ECMWF**

- Share development effort with researchers

Where are we now?

- **Emoslib currently used**

- **Over 20 years old**
- **Very hard to maintain:**
 - **Installation**
 - **Development – no test framework**
 - **Optimisation**
- **Known deficiencies**
 - **Precision of some calculations**
 - **Application of LSM to processing**

- **Rewrite particularly beneficial now**

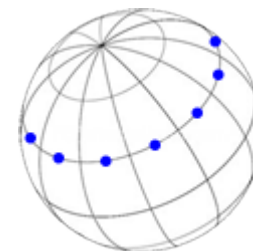
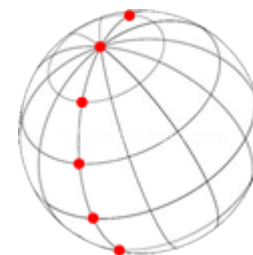
- **Product generation is being redeveloped**

What do we want?

- **Consolidated library that can be used by all tools**
 - Metview / MARS / Product Generation etc.
- **Modern programming language(s)**
 - C++ interface (Python)
- **Ability to distribute computing**
 - OpenMP, GPUs etc.
- **Open architecture, Maintainable code**
 - Open for external contributions (from Researchers and MS)
- **Test framework**
 - Automated regression testing
 - Validation of results

What will it look like?

- **Meteorological Interpolation and Regridding: *MIR***
- **Command-line tool(s) - similar to `grib_api`**
- **C++ API for both Product delivery and MARS**
 - Same results from both
- **Internal restructuring of code base**
 - File reading and writing (GRIB etc.)
 - Data representations (grids)
 - Meteorological logic (e.g. when to apply LSM and which one)
 - Maths (number crunching)
 - *Available to all ECMWF software*



What will it do?

- **Major requirements of Product delivery:**

- **From Spectral to**
 - **Regular and Reduced Gaussian**
 - **Lat / Lon (incl Rotated)**
 - **Spectral**
- **From Reduced Gaussian to**
 - **Regular and Reduced Gaussian**
 - **Lat / Lon (incl Rotated)**
- **From Reduced Lat / Lon to Regular Lat / Lon**

- **Also required for MARS usage:**

- **Regular to Regular grids *etc.***

When do we want it?

- **Development is underway**

- Existing code (not EMOSLIB) heavily refactored into new structure

- **In parallel with Product Delivery project**

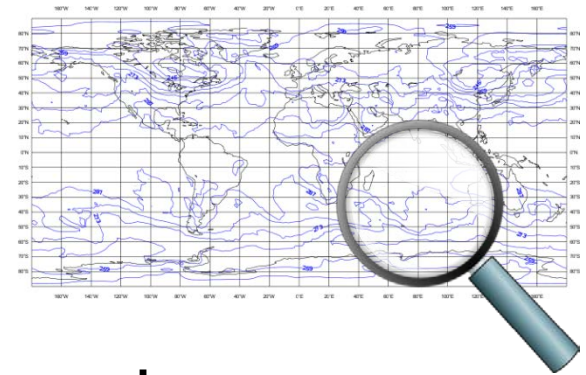
- Incremental delivery of interpolation features as these are:
 - a) Written
 - b) Verified
 - c) Documented
- First prototype due January 2014
 - Single grid type to target grid type
 - Others will follow

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How do we test it?

- **Challenging task**

- Like-for-like testing not always possible
 - Subareas not handled in same way
 - Different computational resolution



- **Continuous regression testing**

- New features will be submitted to test framework

- **Comprehensive test framework**

- Many thousands of MARS retrievals will be made
- Results compared
- Custom web application developed for this purpose:

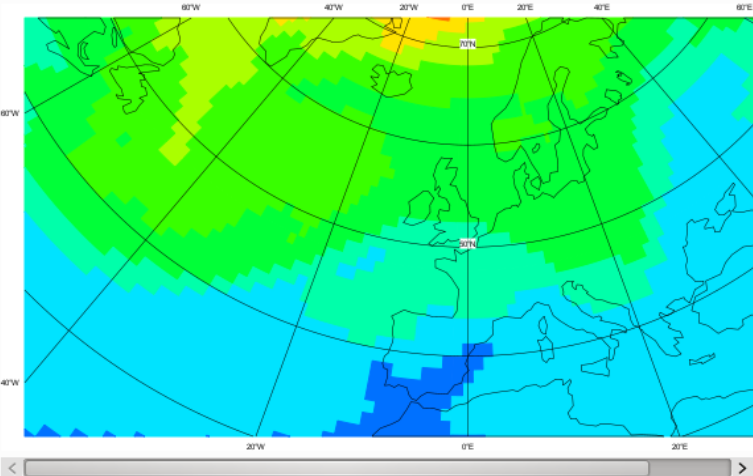
Web app - Visual Comparison

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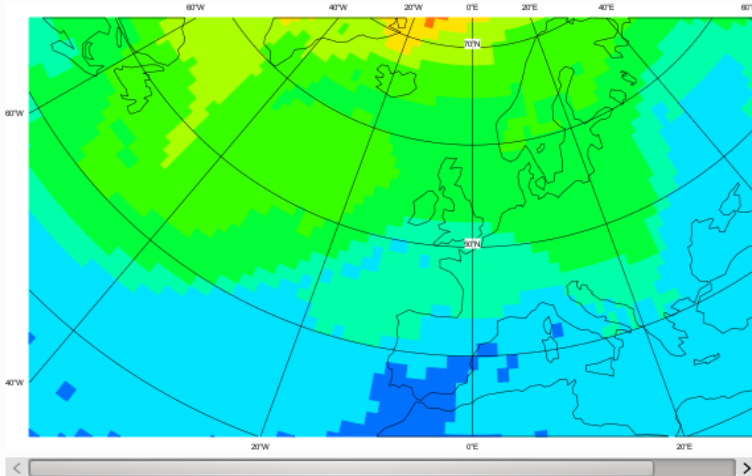
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Message 1/1

Ecregrid 1.9.0



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Web app - Data evaluation

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Message 1/1 [statistics](#) [ls](#) [mars](#) [parameter](#) [time](#) [vertical](#)

EcRegrid 1.9.0

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const	0.0
min	238.456817627
max	302.941192627
skew	40844533.4979
kurt	4539485781.21
avg	273.576893985
sd	15.0656621259

Emos 392 - EcRegrid 1.9.0

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max	0.150192260742
skew	77389.3042257
kurt	11597529.9326
avg	0.00105861877057
sd	0.00380266649183

Emos 392

key	value
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max	303.091384888
skew	40921922.8021
kurt	4551083311.15
avg	273.577952604
sd	15.0694647924

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Summary:

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- **A new interpolation development will:**
 - Provide robust performance for production
 - Give confidence in results
 - Consistency across outputs
 - Spread knowledge throughout development team
 - Provide improvement (reduction) in code base
- **Interpolation working group has been set up**
 - Involve interested parties early
 - New development belongs to all concerned
- ***MIR* development is underway**