The ERA-CLIM data server

13th Workshop on

Meteorological Operational Systems

Cristian Codorean, 03 Nov 2011

The context

The ERA-CLIM project

- **Next episode in the ERA series (FGGE,ERA-15,ERA-40,ERA-Interim)**
- **ERA-CLIM: European Reanalysis of Global Climate Observations**
- **A 3-year collaborative research project (2011 - 2013) towards:**

Building observational datasets for the predictability of global atmospheric, oceanic and terrestrial processes using reanalysis techniques, with a focus on the past 100 years.

The ERA-CLIM project

Key objectives:

- **Improvement of the observational record for the early 20th century**
- **Preparation of satellite observations, boundary conditions, and forcing data for a global atmospheric reanalysis of the 20th century**
- **Production of pilot case reanalyses and data quality information**
- **Development of an Observation Feedback Archive for reanalysis**
- **Assessment and reduction of data uncertainties**

Additional goals:

- **Improving access to climate data, data quality, and transparency**
- **Developing a sustainable capability for data recovery and reanalysis**
- **Meeting requirements for future GMES climate services**

ERA-CLIM data recovery and digitisation

- **RIHMI (Russian Research Institute for Hydrometeorological Information) will recover metadata for the stations in their own archive that cover the Former Soviet Union**
- **50 000 tapes**
- **2 356 000 paper documents for the period 1734-2006**
- **719 000 satellite images for the years 1975-2002**
- **288 000 microfilms for the period 1881-1998**

ECMWF and ERA-CLIM

- **Development of an Observation Feedback Archive (OFA) - A new web-based facility for access to raw input observations, including uncertainty estimates from reanalysis**
- **Production of pilot reanalyses and data quality information**
  - **Database facility for input observations with quality feedback from reanalyses**
  - **A series of long test reanalyses at various resolutions**
  - **All reanalysis products and input observations available via web services**
- **Assessment and reduction of data uncertainties**
  - **Homogenized in-situ data and bias correction techniques**
  - **Improved ocean observations for reanalysis**
  - **Tools for quality assessment of reanalysis products**

The WREP project - Motivations

Web Re-Engineering Project

- ***New requirements exist that cannot easily be met***
- **Increasing use by our supporting states and many commercial customers of our web products**
- **Users request more tailored products**
- **Our web service was designed as state-of-the-art in 2001**
  - **The web has evolved and so have user expectations in usability …**
  - **… New web technologies have evolved to meet these demands**
- **Our web service cannot currently be relied upon operationally**

The WREP project - Goals

- Redesign the web infrastructure so that the web service is highly available
- Provide on-demand plot production
- Provide more interactivity (e.g. zoom, pan, overlay parameters)
- Allow product customisation (e.g. control the event threshold on probability maps)
- Use open (OGC) standards so that ECMWF products can be embedded in users' own software
- Provide an infrastructure that would easily support current and future application

My role

Description of work (official)

- Developing an Observational Feedback Archive (OFA) for observations used in ERA-CLIM reanalyses, including a facility for storing metadata for the observations
- Developing a web-based data server for the OFA data server
- Developing simple visualisations methods for the OFA data server
- Preparing documentation on the web for the OFA data server
- Supporting other data services developments

Description of work (in short)

- **Be sure we provide observations, feedback data and plots to users (mainly external) through a nice web interface**

Requirements

- The need to start archiving observation data in MARS using ODB
- The need for a catalogue describing this data
- The need for a web interface (possibly reusing what's been done before in terms of web development at ECMWF) that displays the catalogue and allows retrieval of data

The work so far

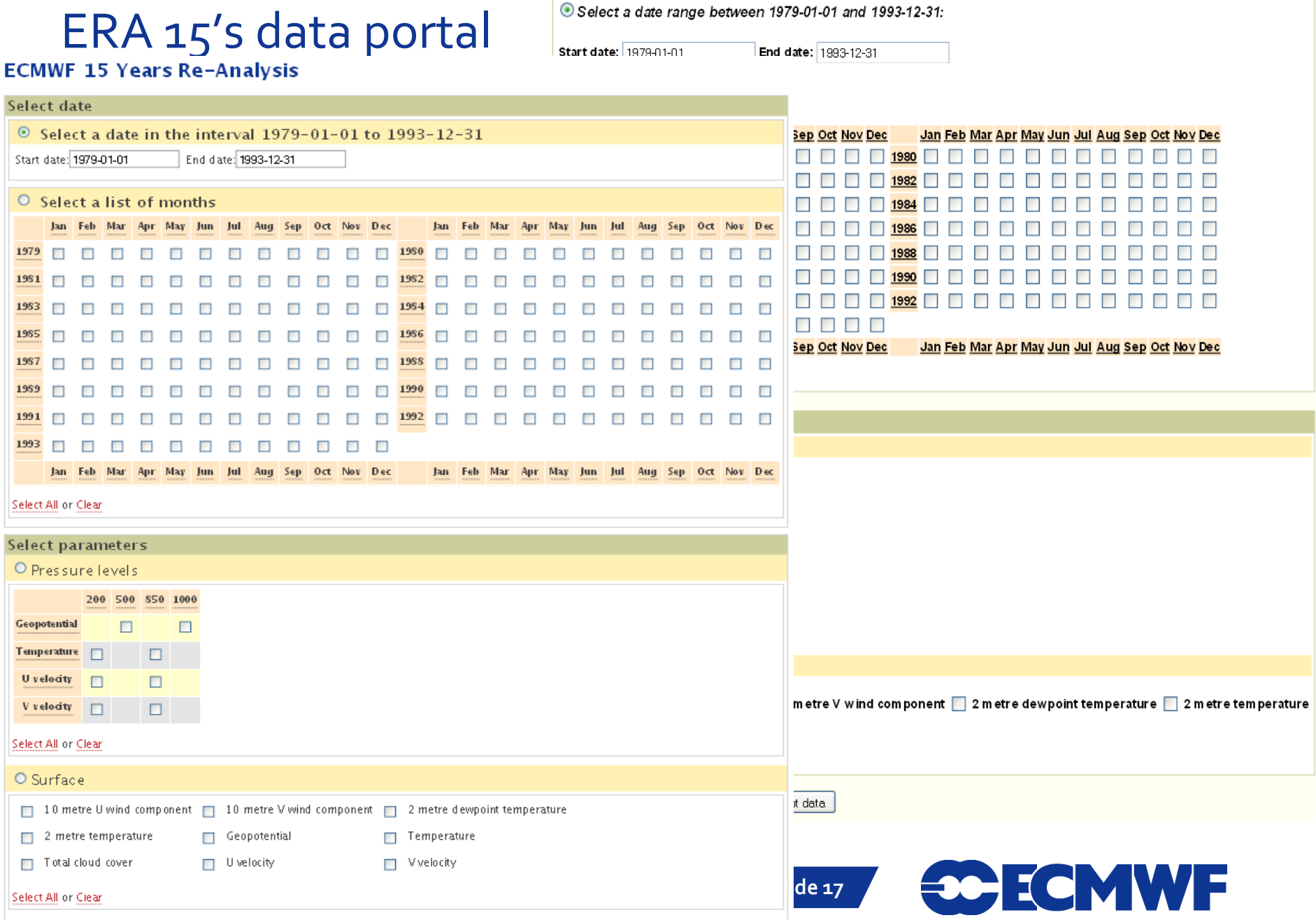
Current status – data

- Observations can now be archived in MARS using the ODB format
- A first set of 'historical' observations has been archived in MARS
- A catalogue has been generated for this data

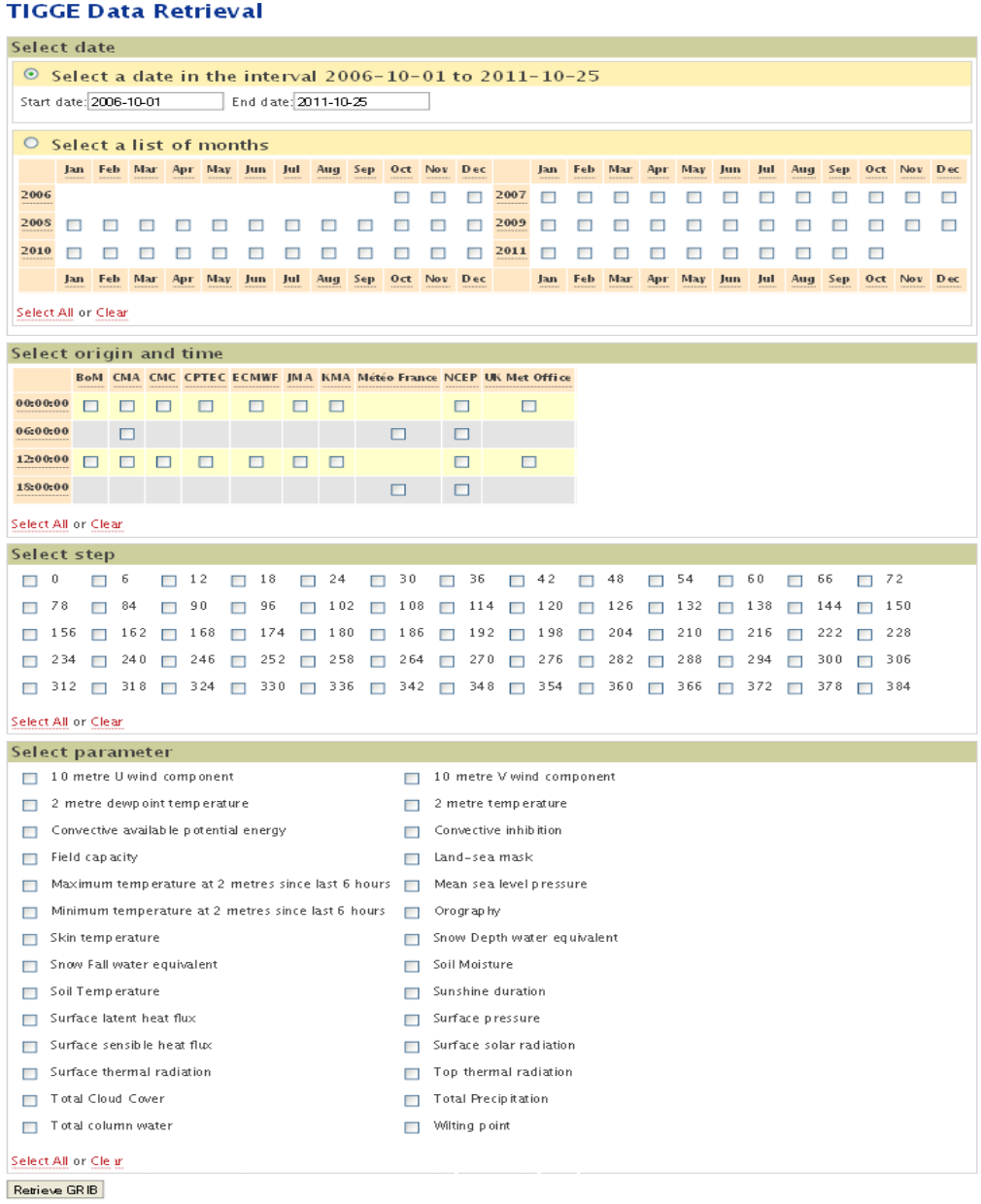
Current status – user interface

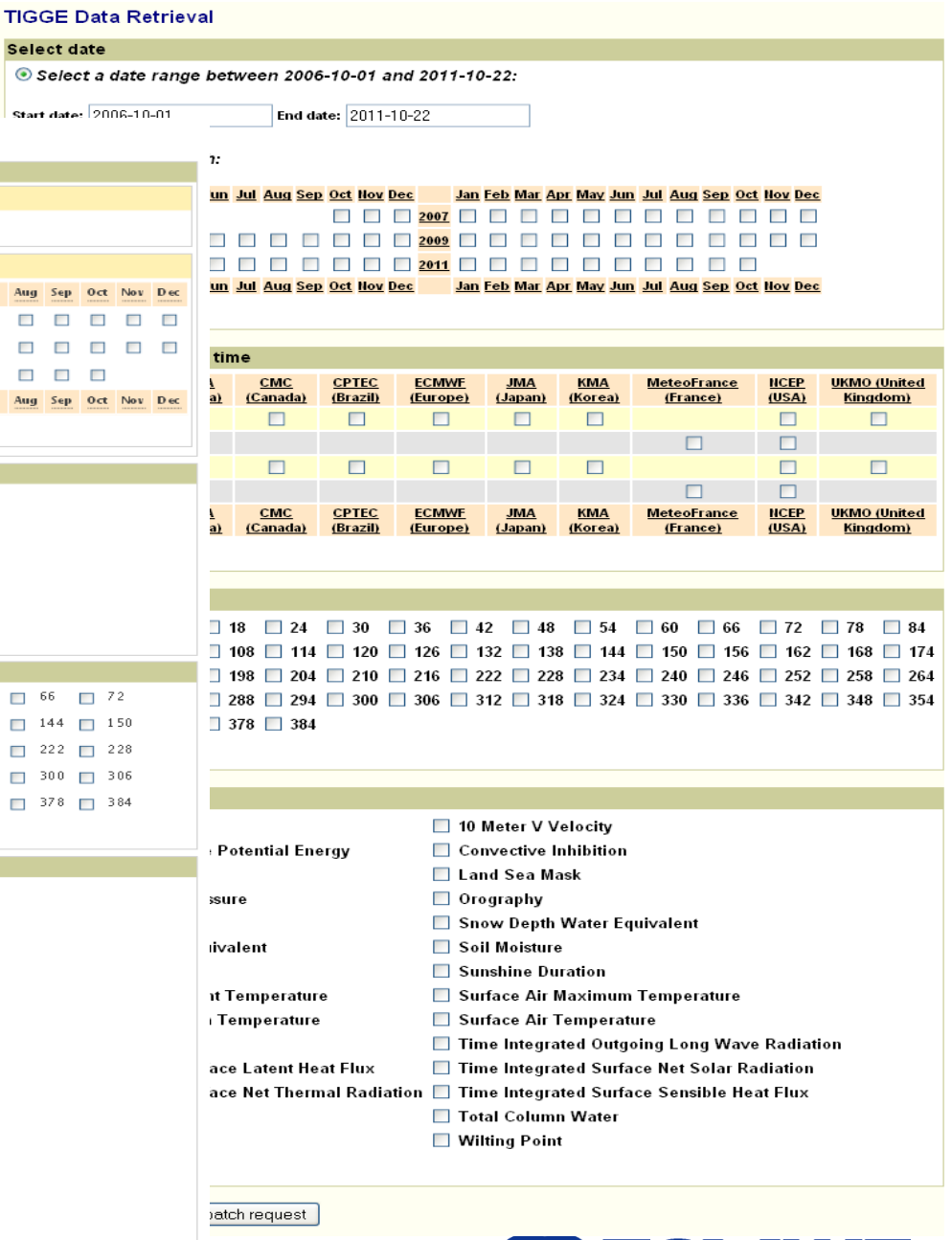
- Web-based data servers already exist for different projects (ERA-40, ERA-Interim, TIGGE, DEMETER, …), however …
- The infrastructure they are based on is not very maintainable, flexible, modular, nor very scalable. It's also quite a few years old and it shows.
- There is the Web Reengineering Project (WREP)
- My tasks extended to migrating old data servers to the new infrastructure, work which also included migrating Webmars

ERA 15's data portal



TIGGE data portal





Webmars

00:00:00

Step (65 values)	Level (25 values)	Parameter (11 values)
0	1	Divergence
3	2	Geopotential
6	3	Ozone mass mixing ratio
9	5	Potential vorticity
12	7	Relative humidity
15	10	Specific humidity
18	20	Temperature
21	30	U velocity
24	50	V velocity
27	70	Vertical velocity

View node in the old webmars.

- Check for availability
- View the batch request
- Estimate request cost
- Retrieve the selection

Current selection:

time 00:00:00 , 12:00:00

date 2011-10-01 , 2011-10-02 , 2011-10-03 , 2 , 2011-10-10 , 2011-10-11 , 2011-10-12 , 2011-10-18 , 2011-10-19 , 2011-10-20 , 2

levtype ml , **pl** , pt , pv , sfc

month jan , feb , mar , apr , may , jun , jul , aug , sep

year 1985 , 1986 , 1987 , 1988 , 1989 , 1990 , 19 2003 , 2004 , 2005 , 2006 , 2007 , 2008 , 20

type 4i , 4v , ab , af , ai , an , ea , ef , fb , **fc** , fg , g

expver **1** , 2 , 3 , 4 , 5 , 6 , 9 , 10 , 11 , 12 , 13 , 14 , 1 35 , 36 , 37 , 38 , 39 , 40 , 41 , 42 , 43 , 45 , 4 9005 , 9017 , 9022 , 9026 , 9032 , 9034 , 903 9641 , 9829 , 9901 , 9914 , 9915 , 9916 , 991 9992 , 9999

stream amap , ammc , cher , cwao , dcda , dcwv , edz ewhc , ewho , fgge , kwbc , lfpw , maed , maw mnfw , mnth , mofc , mofm , msmm , ocea , wamf , wamo , wasf , wave , wehs , weov , wm

class at , atodb , cs , dm , dt , e4 , ei , el , en , er , n

	lat@hdr	lon@hdr	obsvalue@body
1	lat@hdr	lon@hdr	obsvalue@body
2	47.279999	-88.529999	102270.000000
3	47.279999	-88.529999	NULL
4	41.389999	-87.089996	102880.007812
5	41.389999	-87.089996	NULL
6	-75.419998	-59.950012	98920.000000
7	-75.419998	-59.950012	98410.000000
8	-75.419998	-59.950012	NULL
9	-31.900000	116.000000	101330.000000
10	-31.900000	116.000000	NULL
11	-66.970001	-60.549988	99200.000000
12	-66.970001	-60.549988	98760.000000
13	-66.970001	-60.549988	NULL
14	-71.330002	-68.350006	99140.000000
15	-71.330002	-68.350006	98360.000000
16	-71.330002	-68.350006	NULL
17	62.400002	-114.500000	100010.000000
18	62.400002	-114.500000	NULL
19	46.790001	-91.390015	102540.000000
20	46.790001	-91.390015	NULL
21	47.270000	-91.250000	102469.992188
22	47.270000	-91.250000	NULL
23	41.400002	-82.549988	102340.000000
24	41.400002	-82.549988	NULL
25	46.049999	-85.260010	102070.000000
26	46.049999	-85.260010	NULL
27	46.560001	-90.440002	102540.000000
28	46.560001	-90.440002	NULL
29	41.860001	-80.970001	102030.000000
30	41.860001	-80.970001	NULL
31	42.090000	-86.489990	102740.000000
32	42.090000	-86.489990	NULL
33	42.470001	-82.880005	102200.000000
34	42.470001	-82.880005	NULL
35	42.590000	-87.809998	102810.000000
36	42.590000	-87.809998	NULL
37	43.250000	-77.589996	101660.000000

ameter
values)

mixing ratio
ticity
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city

or NetCDF (experimental)

3, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,

jul, aug, sep, **oct**

89, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997,
02, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010,

b, **fc**, fg, go, ia, im, ob, oi, oldim, sim, tf

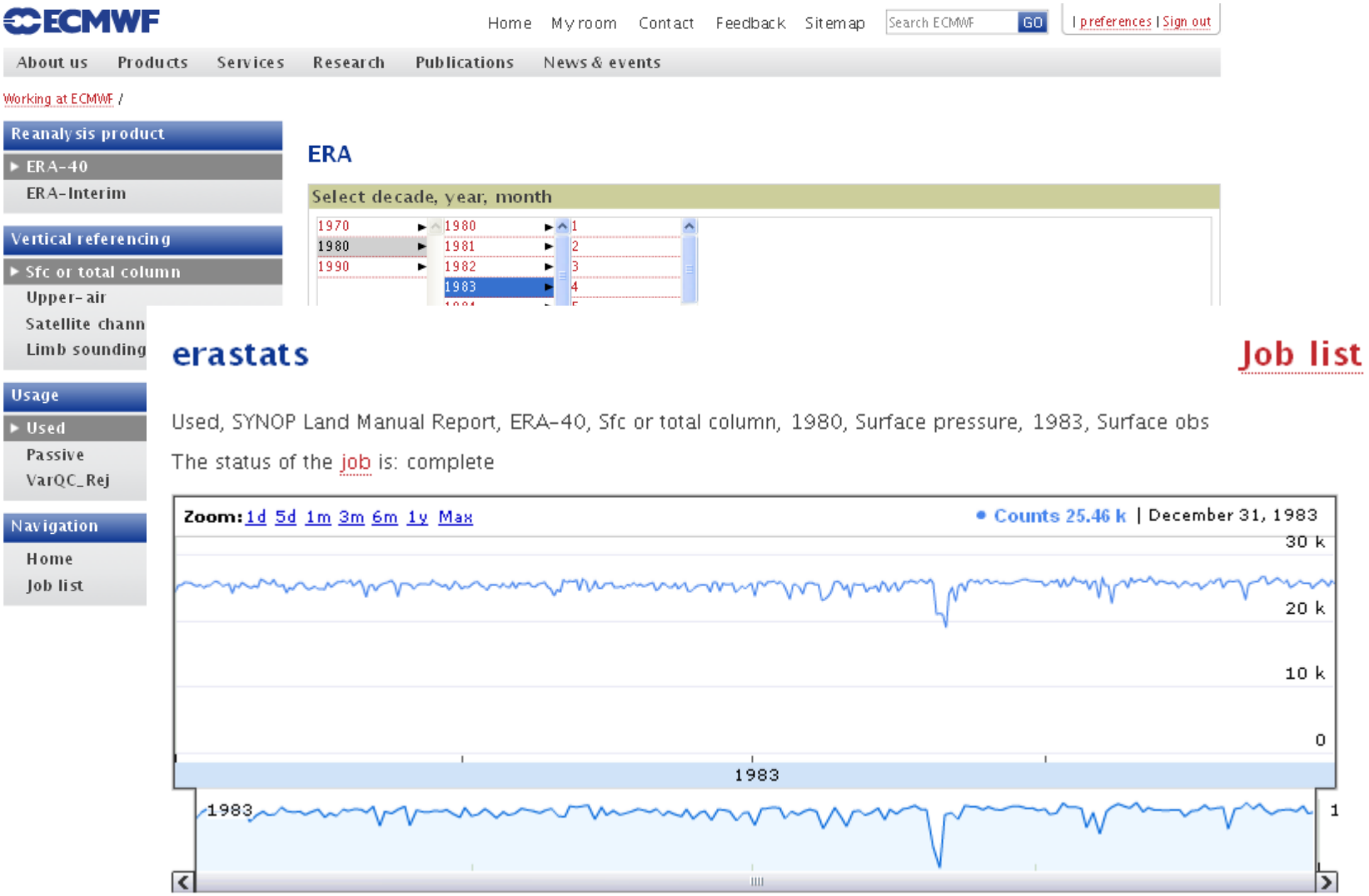
, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28,
6, 37, 38, 39, 40, 41, 42, 43, 45, 46, 47, 48, 5012, 5013,
04, 9005, 9017, 9022, 9026, 9032, 9034, 9035, 9041,
47, 9133, 9233, 9641, 9829, 9901, 9914, 9915, 9916,
32, 9933, 9934, 9935, 9941, 9942, 9943, 9991, 9992,

da, dcwv, edzw, efhc, efho, efhs, efov, egrr, ehmm, enda,
da, ewhc, ewho, fgge, kwbc, lfpw, maed, mawv, mfam,
mmsa, mmsf, mnfc, mnfh, mnfm, mnfw, mnth, mofc, mofm,
a, scwv, seas, sens, sfmm, smma, supd, swmm, toga,
/e, wehs, weov, wmfm

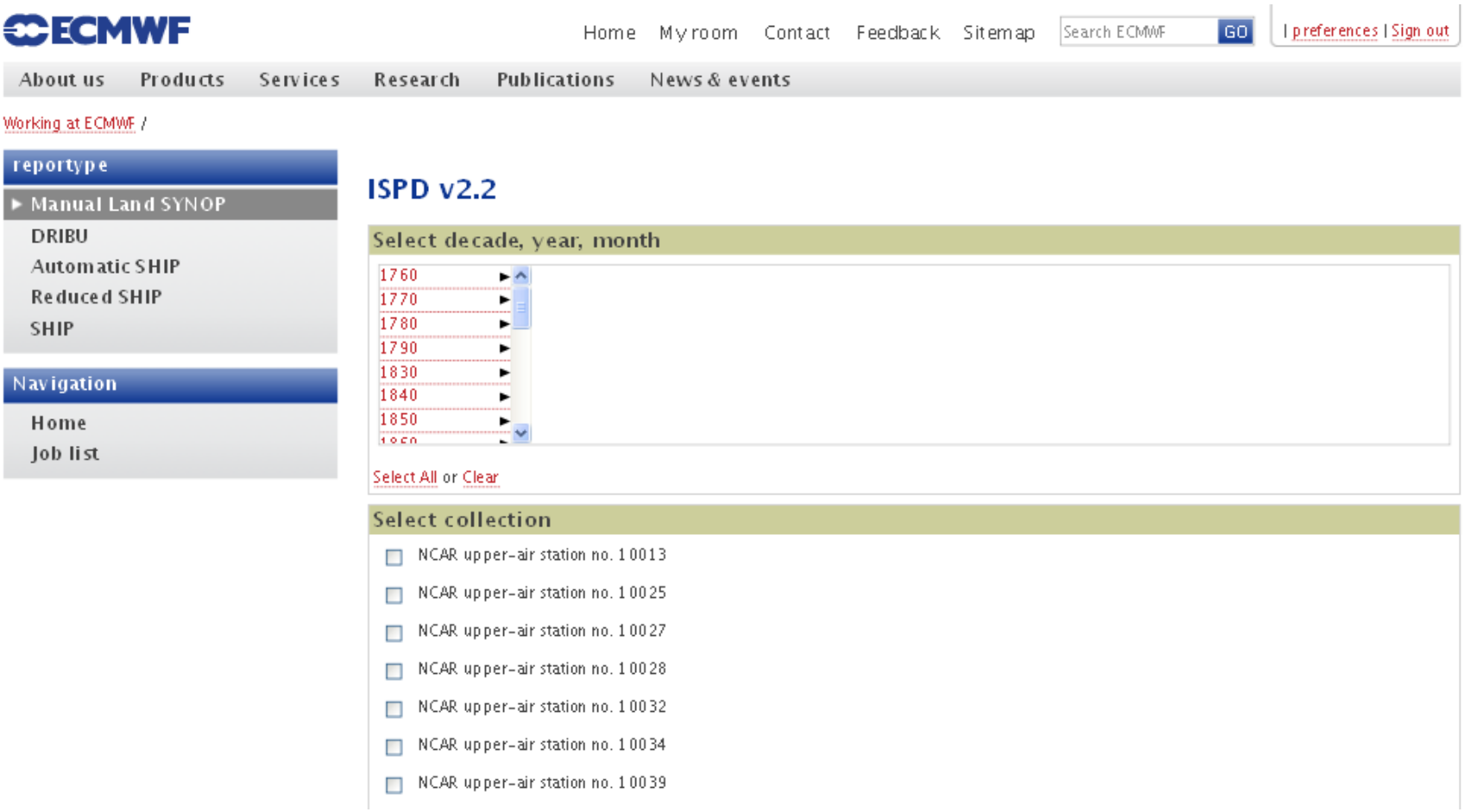
ie, it, nl, no, pt, rd, se, te, tr, uk, cs, dm, dt, e4, ei, el, en,
ms, ti

ECMWF

ERA40/Interim

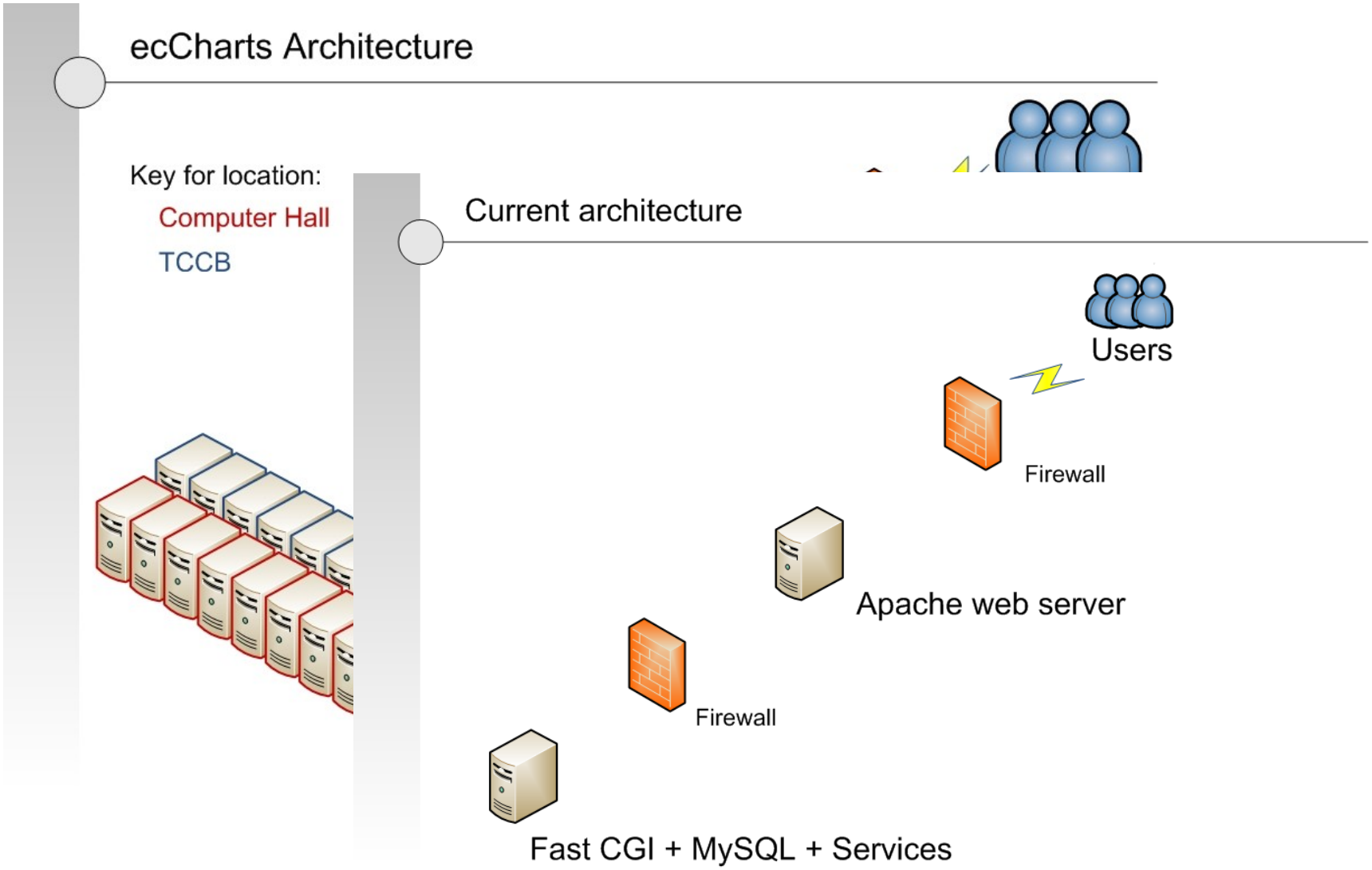


ISPD (International Surface Pressure Databank)



There is more to it than meets the eye

Architecture



Architecture

WREP

- High availability
- Reliability
- Load balancing
- Decoupling of responsibilities
- Scalability
- Extensibility
- Supports more users
- Better performance

Current

- Simpler

The software

WREP

- Python
- Django
- Jquery
- Template system
- Broker / worker architecture

Current

- Perl
- Fast CGI

Where it's going

- 100 years of observation and feedback data in MARS (ODB)
- Catalogue this data and make it available through the web interface for download for the ERA-CLIM project
- Fully migrate Webmars and all other web data servers to the new web infrastructure
- Later, make some statistics available and some nice plots

References

- **Webmars: http://www.ecmwf.int/services/archive/d/catalog**
- **Data servers: http://data-portal.ecmwf.int/**
- **ECMWF ERA activities: http://www.ecmwf.int/research/era/do/get/index**
- **ERA-CLIM: http://era-clim.eu/**

Thank you !