Copernicus Climate Change Service (C3S): Status and plans

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C3S Vision

- To be an authoritative source of climate information for Europe
- To build upon national investments and complement national climate service providers
- To support the market for climate services in Europe
C3S Vision

How is climate changing?
- Earth observations
- Reanalysis

Will climate change continue/accelerate?
- Predictions
- Projections

What are the societal impacts?
- Climate indicators
- Sectoral information
Turning research into operational services for the benefit of EU citizens

C3S in a nutshell

C3S Service Element

organisation

from European Commission e.g., FP7 Space calls, H2020

Climate Data Store

from other bodies e.g., Member States, ESA, EUMETSAT, EEA, WMO..

Sectoral Information System

Stakeholders & users

Evaluation & QC function

Outreach & Dissemination

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C3S Service elements: Climate Data Store

- Essential Climate Variables for atmosphere, ocean, land and Climate Indicators
  - Observed, re-analysed and simulated data
  - In support of adaptation/mitigation policies at global and European level
2014 globally the warmest year on record – or not?

 Estimates based on station data alone do not account for variability at high latitudes
Reanalysis provides a truly global view…

- ERA-Interim estimates for 2014 are slightly cooler than those from station data alone
- Mainly due to the Antarctic
- Consistent with independent observations of sea-ice extent
## ERA-Interim vs. ERA5

<table>
<thead>
<tr>
<th>Model version</th>
<th>August 2006 (IFS Cy31r2)</th>
<th>June 2015 (IFS Cy41r2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model boundary conditions</strong></td>
<td>As in forecasting (inconsistent SST)</td>
<td>Appropriate for climate (CMIP5, HadISST.2)</td>
</tr>
<tr>
<td><strong>Spatial resolution</strong></td>
<td>79 km global 60 levels to 10 Pa</td>
<td>31 km global 137 levels to 1 Pa</td>
</tr>
<tr>
<td><strong>Time period</strong></td>
<td>1979 - present</td>
<td>1979–present (extension to ~1950?)</td>
</tr>
<tr>
<td><strong>Dissemination</strong></td>
<td>Monthly</td>
<td>Monthly for ERA5; daily for ERA5T</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>Mostly ERA-40, GTS</td>
<td>Various reprocessed CDRs</td>
</tr>
<tr>
<td><strong>Radiative transfer</strong></td>
<td>RTTOV7</td>
<td>RTTOV11</td>
</tr>
<tr>
<td><strong>Analysis method</strong></td>
<td>4D-Var 1D+4DVar rain</td>
<td>10-member EDA All-sky radiance assimilation</td>
</tr>
<tr>
<td><strong>Variational bias corrections</strong></td>
<td>Satellite radiances</td>
<td>Radiances, ozone, aircraft, surface pressure, radiosondes</td>
</tr>
</tbody>
</table>

ERA5 to be completed (real time) by end 2017
C3S Service elements: Sectoral Information System

- Tailored climate indicators for primary users:
  - Institutional users at European level (EEA, Climate-ADAPT, ...)
  - Science users, innovation and business development
- Data and tools to support public and commercial applications, policy development and strategic planning

~ 30 ECV datasets and ~ 10 sectors to be addressed by 2020-2021
C3S Service elements: Sectoral Information System

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C3S Service elements: Evaluation and Quality Control

- Ensures C3S delivers state-of-the-art climate information to end-users
- Identifies gaps in the Service
- Bridges Copernicus with Research Agenda in Europe (e.g. H2020, national research projects)
- Monitors continually, quality of C3S products and services
- "Quality Assurance" body
C3S Service elements: Outreach & Dissemination

- Web content provision & management
  - Coherence throughout C3S, interfaces between service elements, pan-European dimension...
- Public outreach
  - All media
  - Annual State of Climate for Europe
  - Downstream service providers
- Coordination with national outreach efforts
  - On communicating events, findings, etc
  - National workshops
Copernicus Climate Change Service (C3S)

Provisional timing

- **Stage 0 - Proof of Concept**
- **Stage I - Pre-Operational**
- **Stage II - Operational** ~20 ECVs, ~5-6 Sectors
- **Stage III - Operational** ~30 ECVs, ~8-10 Sectors

PoC + Pre-operational Phase

Operational Phase
C3S is user driven

Please let us know your feedback, requirements ideas ...

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