Climate Change

Climate Change Service

Overview & Outlook

Jean-Noël Thépaut

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The C3S mission

To support European adaptation and mitigation policies by:

- Providing consistent and authoritative information about climate
- Building on existing capabilities and infrastructures
- Stimulating the market for climate services in Europe

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A one-stop Climate Data Store

We are building a store.

We are putting products on the shelves.

Soon we will open the door to customers.

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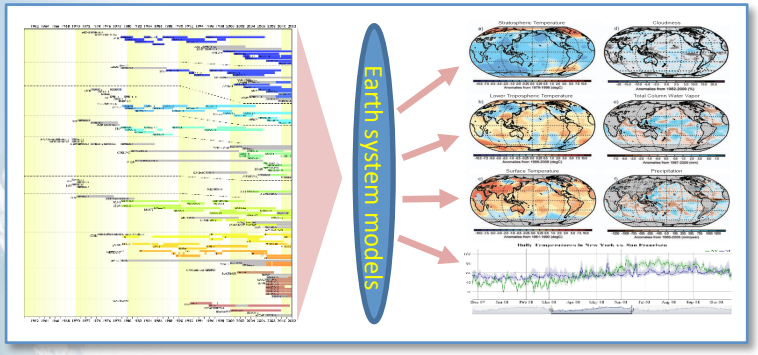
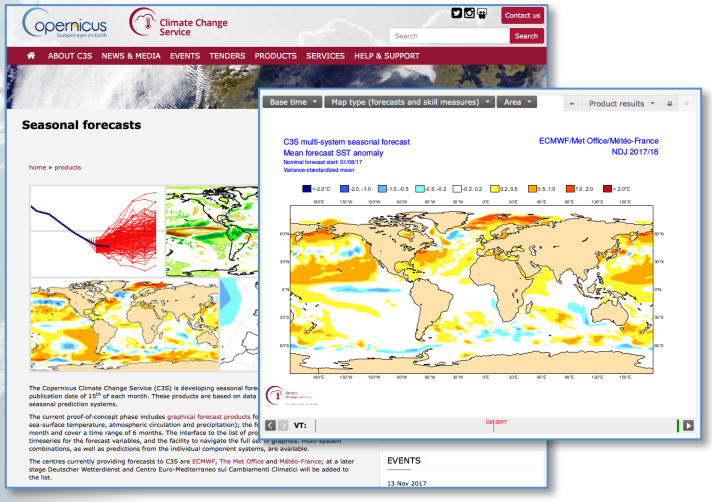
Access to past, present and future climate information

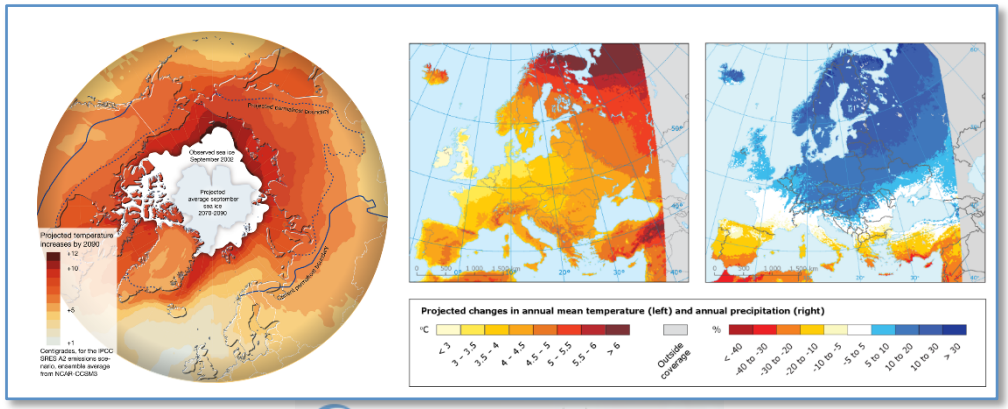


Observations and climate reanalyses

Seasonal forecast data and products

Climate model simulations





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C3S - Development timeline

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Signature of Delegation Agreement

March: first C3S General Assembly

C3S first operations

2014 2015 2016 2017 2018 2019 2020 2021

Stage 0/I

Stage II

Stage III

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Climate Data Store Content

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C D S - c o n t e n t

Scientific basis:

- Essential Climate Variables as defined by GCOS
- GCOS Status Report and Implementation Plan
- IPCC, CMIP

Observations	Global estimates of ECVs from satellite and in-situ observations	Reprocessed CDRs, reference observations	Support for data rescue, climate data collections
Climate reanalysis	Global atmosphere, ocean, land	Regional reanalysis for Europe	Coupled climate reanalysis for 100 years
Model output	Multi-model seasonal forecast products	Access to CMIP data and products (global and regional)	Reference set of climate projections for Europe

Climate Indicators

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Climate Data Store: Reanalyses

ERA5 global reanalysis:

- Atmosphere/land/wave parameters
- 31 km global resolution, 137 levels
- Hourly output from 1979 onward
- Will be extended back to 1950s

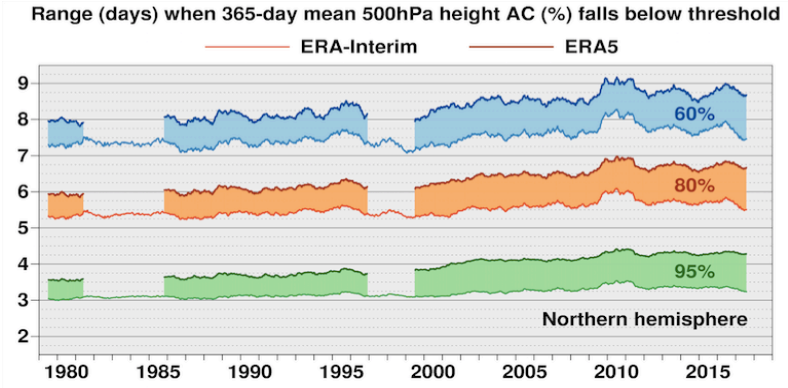
- Based on IFS Cy41r2 (March 2016)
- Using improved input observations
- Ensemble data assimilation
- Providing uncertainty estimates

- First release of 2008-2017 dataset

- Full release Q3 2018

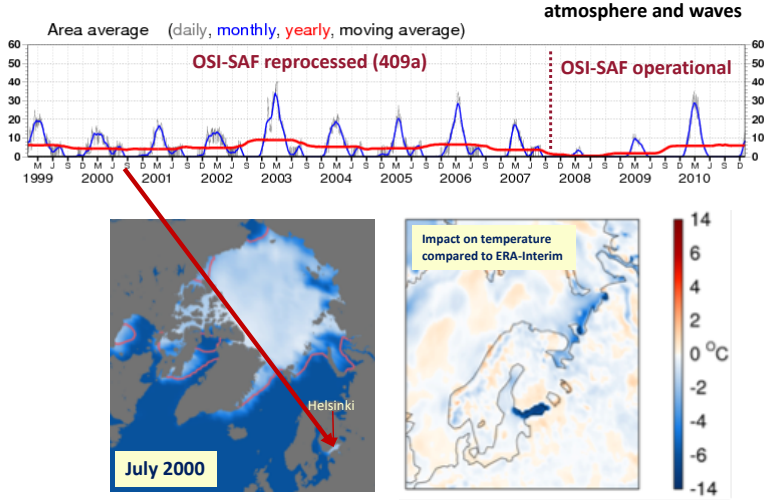
Regional reanalysis:

- European + Arctic domains
- Higher spatial resolution



Spurious Sea-ice in Baltic Summer

Occurs each year (from 1979 - 2007)
Has detrimental effect on atmosphere and waves



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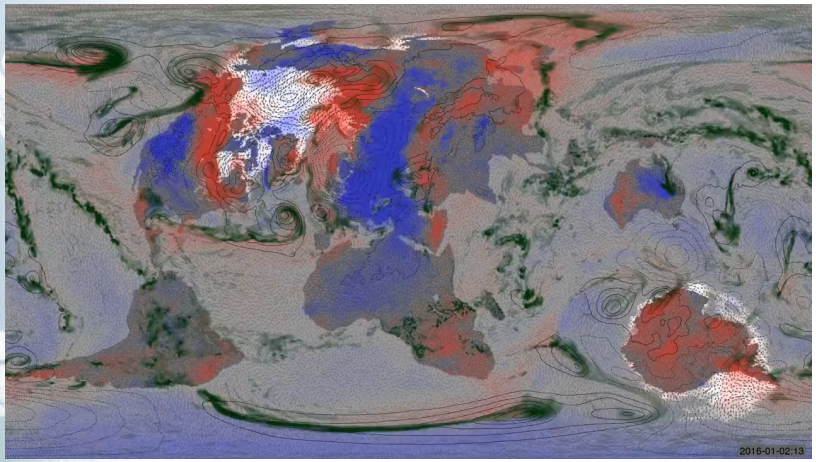
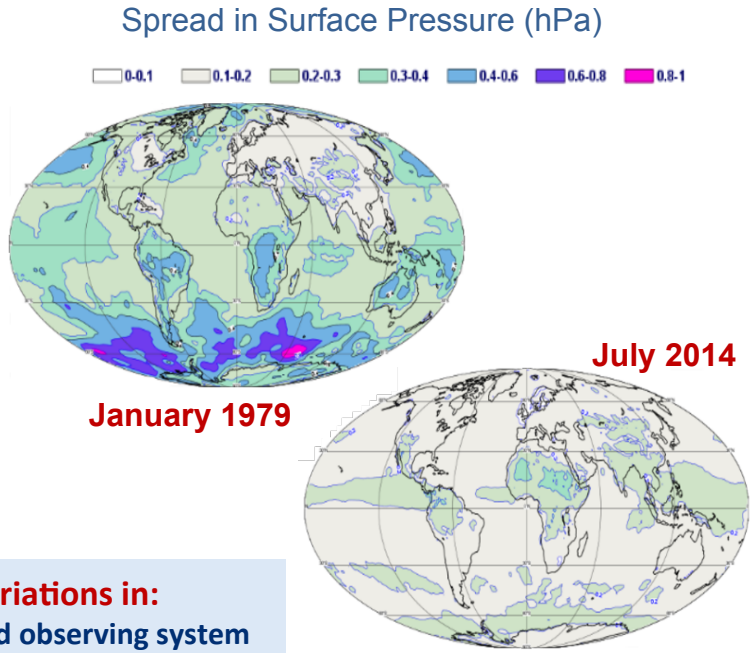
What is new in ERA5?

Hourly data and more parameters



Courtesy: Philip Brohan

Uncertainty estimate



Reflects variations in:

- ingested observing system
- flow-dependent sensitivity

Credit: H. Hersbach, ECMWF

Earth Observation based ECVs in C3S

			C3S_312a				
				C3S_312b			
		GCOS	2017	2018	2019	2020	2021
Atmospheric physics							
	Precipitation	4.3.5		Lot 1			
	Surface Radiation Budget	4.3.6					
	Water Vapour	4.5.3					
	Cloud Properties	4.5.4					
	Earth Radiation Budget	4.5.5					
Atmospheric composition							
	Carbon Dioxide	4.7.1	Lot 6		Lot 2		
	Methane	4.7.2	Lot 6				
	Ozone	4.7.4	Lot 4				
	Aerosol	4.7.5	Lot 5				
Ocean							
	Sea Surface Temperature	5.3.1	Lot 3		Lot 3		
	Sea Level	5.3.3	Lot 2				
	Sea ice	5.3.5	Lot 1				
	Ocean Colour	5.3.7					
Land hydrology & cryosphere							
	Lakes	6.3.4			Lot 4		
	Glaciers	6.3.6	Lot 8				
	Ice sheets and ice shelves	6.3.7					
	Soil moisture	6.3.16	Lot 7				
Land biosphere							
	Albedo	6.3.9	Lot 9		Lot 5		
	Land Cover	6.3.10					
	Fraction of Absorbed Photosyntheti	6.3.11	Lot 9				
	Leaf Area Index	6.3.12	Lot 9				
	Fire	6.3.15					
			2017	2018	2019	2020	2021

Heritage/coordination:

- ESA CCI(+)
- EUMETSAT SAFs
- Other Copernicus Services
- etc..

- Multiple datasets
- Provision of uncertainty estimates
- Focus on stability and consistency
- ..

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C3S 312a Lot2 Sea Level production service

- The **Sea Level ECV** produced within the C3S (312a_Lot2) is derived from **satellite altimetry**.
- The service is ensured by **CLS and LEGOS** (France)
- **Gridded daily maps** of **sea level anomalies** and **velocities** are provided in delayed-time in the **global ocean**, **Mediterranean** and **Black seas** during 1993-2017.
- **Users** are interested in **sea level changes**, **ocean dynamics**, **data assimilation for climate projections**, **model validation**, …

- Strong **interaction and complementarity** with the **Copernicus Marine Service (CMEMS):**
  - **C3S**: retrieval of **long-term variability** and
    focus on the **Mean Sea Level stability**
    with a stable altimeter constellation in time.
  - **CMEMS**: focus on the **mesoscale estimation** with
    all satellites missions available to provide the best sampling.

- Strong **interaction** is required with **Copernicus space component** and **space agencies:**
  - To **manage satellite databases** and
  - To phase the production with R&D activities (ESA CCI+…)

CLS
COLLECTE LOCALISATION SATELLITES

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C3S seasonal forecasts

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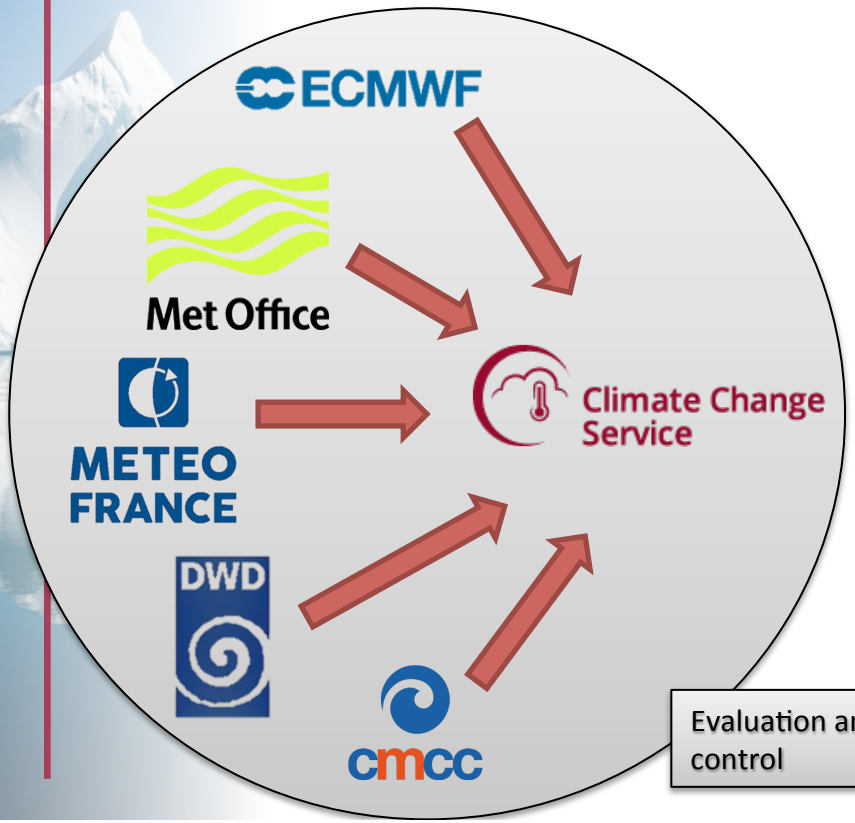
Aim: to generate seasonal forecast products based on the best information available, to an operational schedule, and make them publicly available.



Horizontal grid: global 1deg x 1deg
Ensemble size:

- Forecasts: ~50 members
- Hindcasts: ~25 members x 24 years (1993-2016)

Variables

- Surface
  - 7 vars every 6h
  - +30 vars every 24h
- Pressure (11 levels, from 925 hPa to 10 hPa)
  - 8 vars every 12 h

Agreed netCDF specification C3S-0.1 (based on CF)

Evaluation and quality control

Climate Data Store

Infrastructure and toolbox

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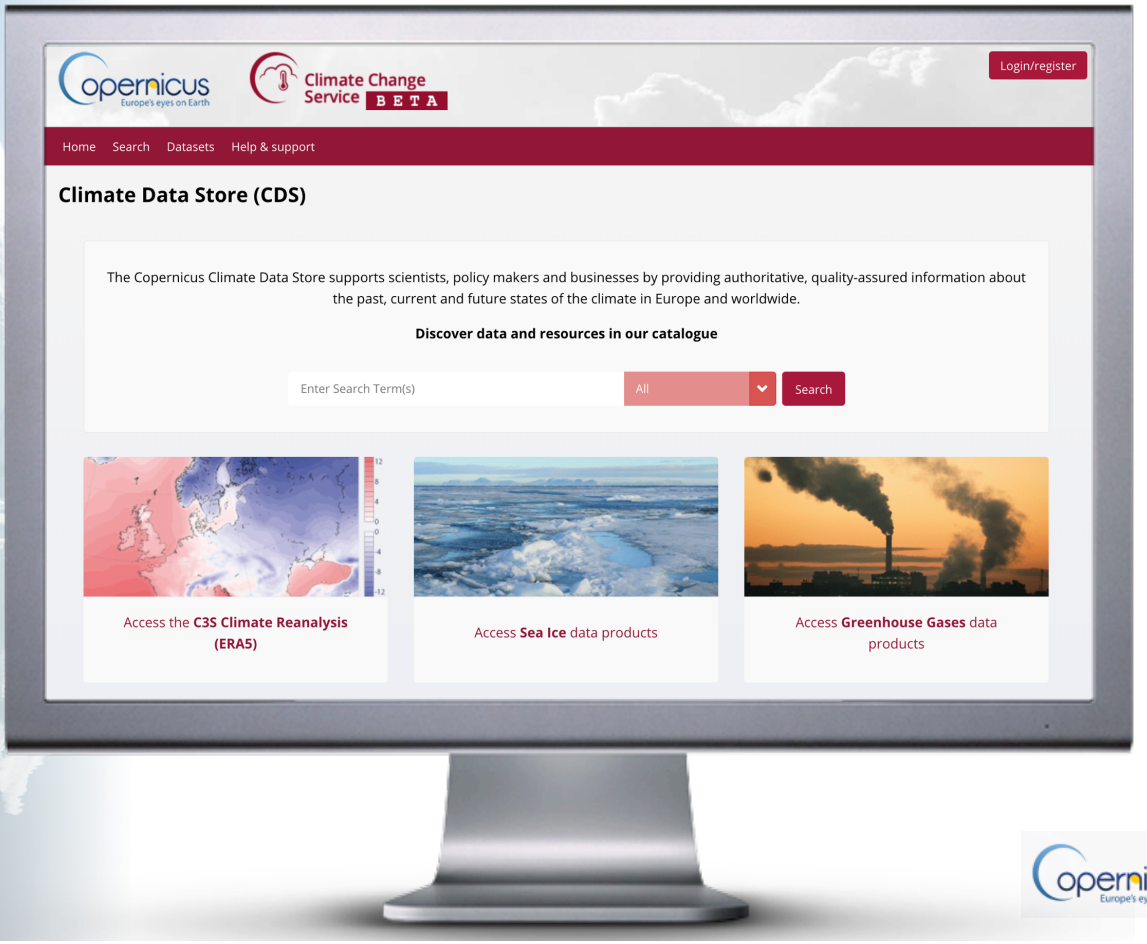
Climate Data Store – Current Status



The CDS contains **observations**, global and regional **climate reanalyses**, global and regional **climate projections** and **seasonal forecasts**

The CDS is designed as a **distributed system**, providing improved access to **existing datasets** through a **unified web interface**

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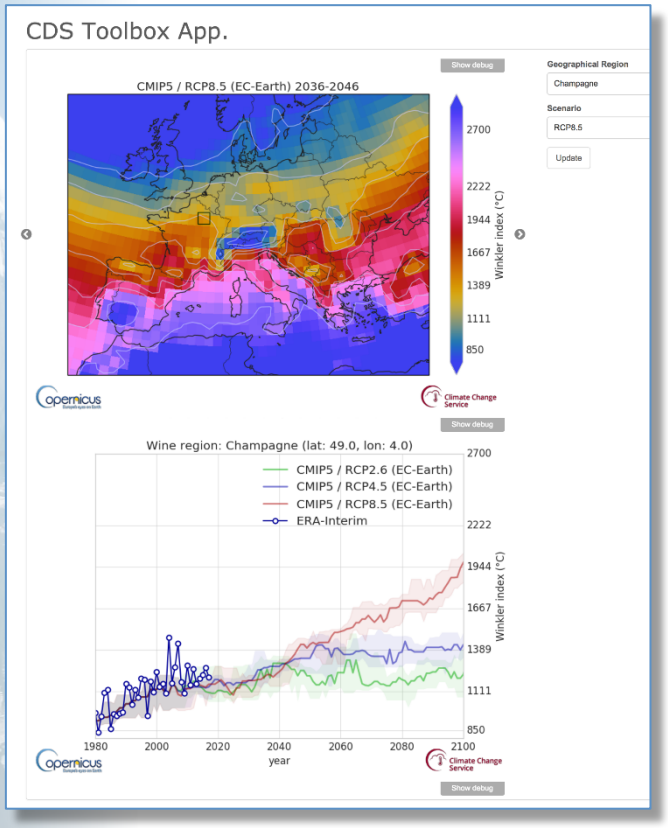
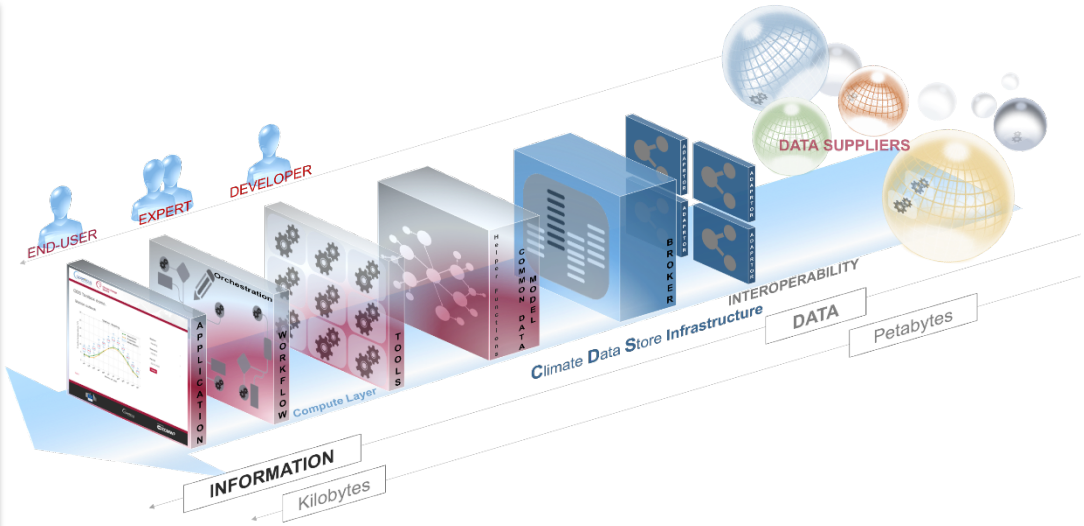
Access to tools, workflows and applications





CDS infrastructure beta version: February 2018
CDS toolbox beta version: March 2018

Open to Public: End of March 2018

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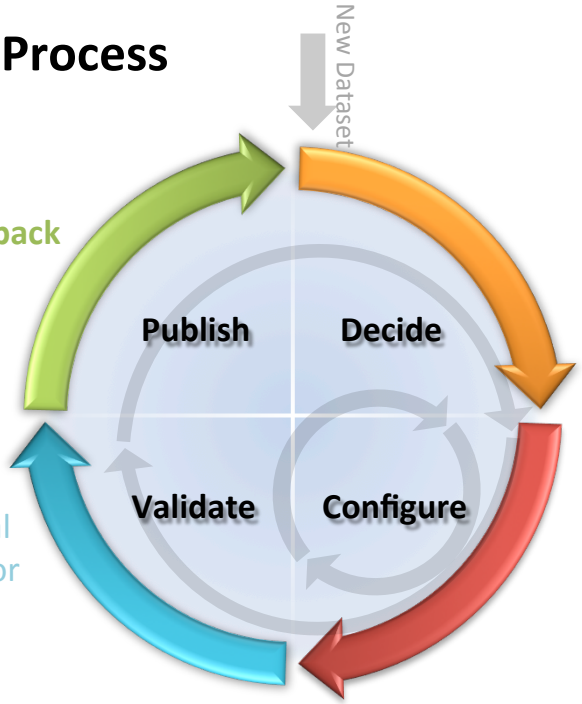
Dataset Integration Process



Publish:
- Collect user **feedback**

Decide:
- ✓ CDS catalogue entries
- ✓ Granularity

Configure:
- ✓ Catalogue **Overviews**
- ✓ **Quality** Assessment **Briefs**
- ✓ **Documentation**
- ✓ Sub-selection **Forms**
- ✓ Toolbox Application
  - Common Data model
  - Import Mapping

Validate with C3S Technical Officers, Stakeholder and/or EQCs team

Test downloads

Create adaptors
(if not existing)

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