



Funded by the  
European Union



# WP4: REANALYSIS PROTOTYPES

Kick-off meeting, 17 January 2023

Hans Hersbach, Harald Schyberg  
ECMWF, MET Norway

WP4 Lead: Hans Hersbach (ECMWF)

Harald Schyberg (MET Norway)



WP4 Partners:

ECMWF	36.0 pm
MET Norway	26.0 pm
SMHI	21.0 pm
MF	19.6 pm
DMI	18.0 pm
TOTAL	120.6 pm ~ 2.9 FTE (48 months)

# WP4 scientific / technical questions

Improve the land data assimilation system (LDAS) of both future C3S global and regional reanalysis

- replace univariate sub-analyses by one multivariate LDAS

Improve the coupling of LDAS with the atmosphere

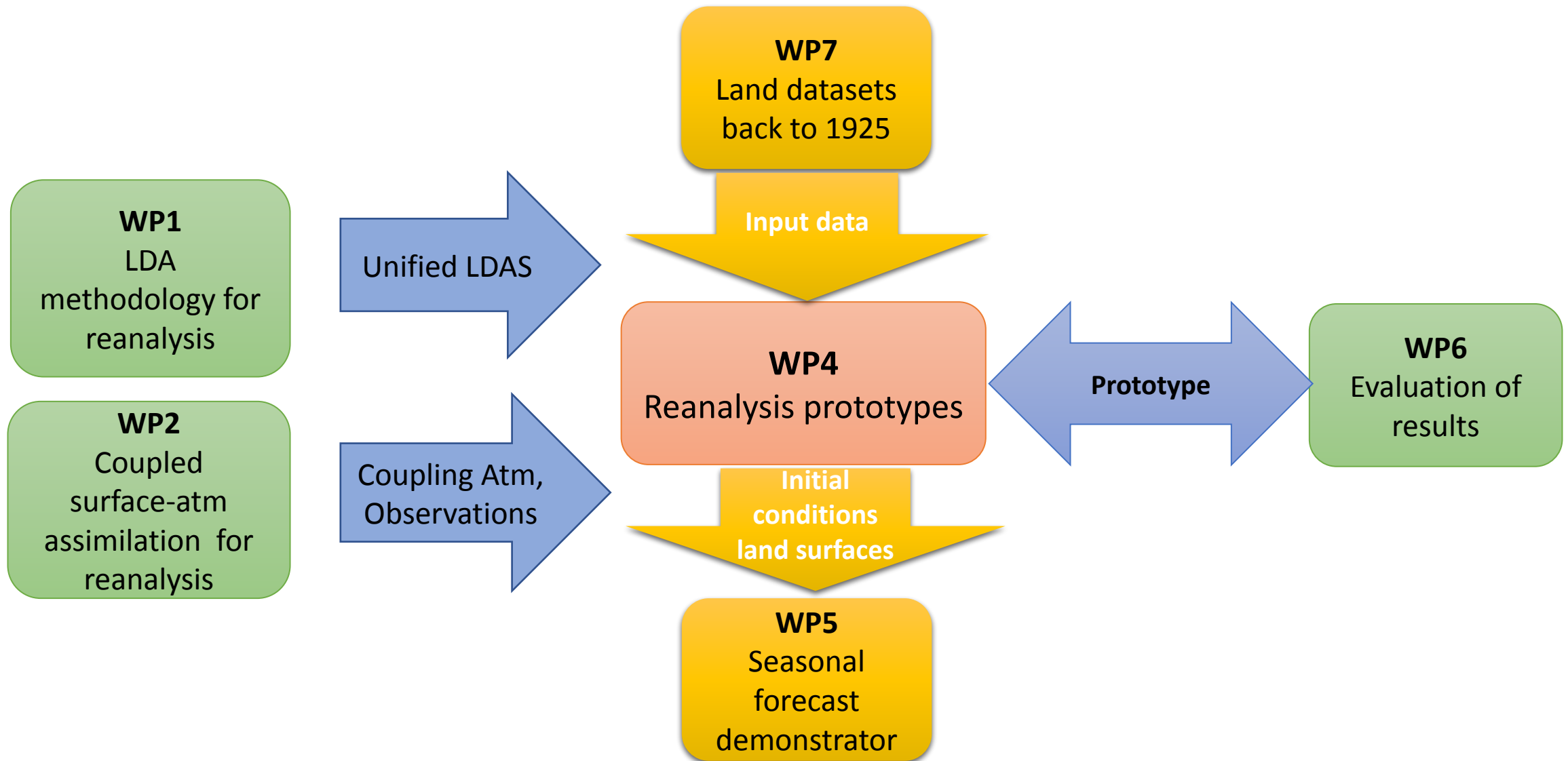
- implement a stronger way of coupling

Better exploit observations that are sensitive to both land and atmosphere

# Goals and deliverables of WP4

- Demonstrate proof of concept of land and coupled land-atmosphere developments for future implementation in the C3S reanalysis systems
- Design, develop, produce and deliver a set of global and regional-scale reanalysis prototypes.
- Land only prototypes and coupled reanalysis prototypes
- C3S Global (for future ERA7) and regional (for future CARRA3, CERRA2) coupled reanalysis prototypes

# WP4 links to other WPs



# Task 4.1 – Global Land reanalysis (M01-33)

## Lead ECMWF

Global products from 1940 – post 2020, atmospheric forcing from ERA5

- **Deliverable 4.1:** ERA6-Land-Pv2 Land prototype to provide a basis for ERA6-Land (data, M33)
- **Milestone M7:** Provision of a benchmark surface reanalysis product to provide homogeneous initial conditions for SEAS6 and ERA6 (M09)
- **Milestone M8:** Capability of a system to downscale global reanalysis in a consistent and balanced way and taking account of slow-varying land surface conditions (M27)

## ERA6-Land-Pv1 (M01-09)

- Include DA (snow + soil moisture)
- Benchmark for other global prototypes

## ERA6-Land-Pv2 (M16-33)

- Progressively include time-evolving land products from T7.3 and T7.4
- Update DA to using unified DA from T1.2 and T1.3

# Task 4.3 – Global Coupled reanalysis (M25-48)

## Lead ECMWF

Global reanalysis prototypes tested for a few sub periods

- **Deliverable 4.2:** Deliver ERA7-Pv2 second prototype as preparation for ERA7 (data, M48)
- **Milestone 9:** Proof of concept for a coupled data assimilation system to provide consistent and balanced reanalysis products for land and atmosphere (M36)

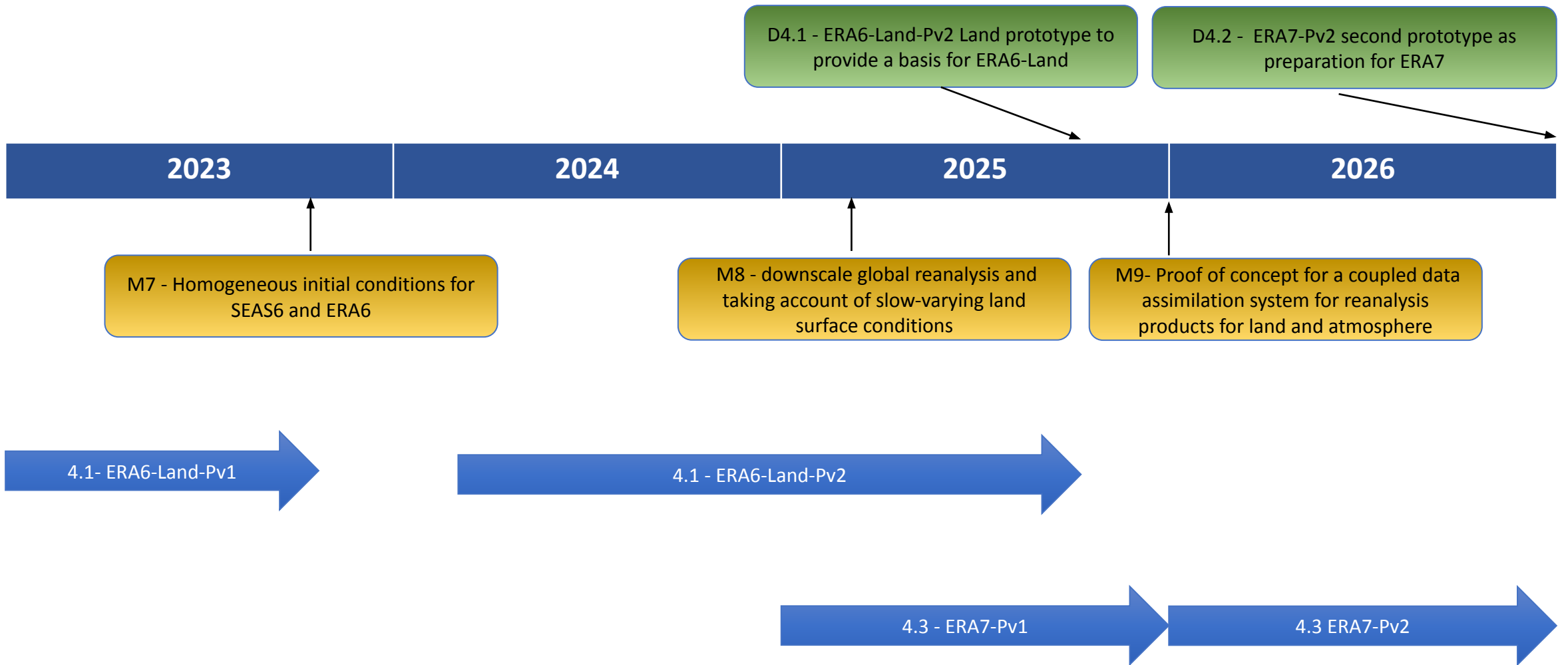
## ERA7-Pv1 (M25-36)

- First full two-way coupled global reanalysis prototype
- Unified LDAS from T1.3 and outer-loop coupling T2.2

## ERA7-Pv2 (M37-48)

- Include enhanced usage of interface observations from T1.4 and T2.3 + prelim from T2.4

# Timeline and deliverables global prototype (T+0 -> T+48)





# Task 4.2 – Regional land reanalysis

**MET Norway (lead), SMHI, DMI:**

**CARRA-Land-Pv1 (M19-24)**

- Arctic offline surface prototype reanalysis (indicatively time slices 1991-95 and 2016-20) at resolution of 2.5 km or finer.
- Forcing from the C3S CARRA1 East domain data set, adding land DA developments conducted in SURFEX in WP1

**CARRA-Land-Pv2 (M24-32)**

- Arctic offline surface prototype reanalysis (within the same time slices as for CARRA-Land-Pv1) evolving on CARRA-Land-Pv1
- Forcing from the CARRA2 pan-Arctic dataset, integrating more developments from WP1 and preliminary outcomes from WP2

**MF:**

**CERRA-Land-P (M25-36)**

- Europe offline reanalysis prototype for 1993 to 2019 at 5.5 km resolution.
- Forcing from the C3S CERRA and CERRA-Land, and LUH2 land use land cover, integrating the surface varying conditions from WP7

# Task 4.4 – Regional coupled reanalysis

**MET Norway (lead), SMHI, DMI:**

**CARRA3-Pv1 (M19-36):**

- Regional reanalysis demonstrator for a pan-Arctic domain for a full year post 2015 at a targetted spatial resolution of 3.75 km
- Using developments from WP1 and WP2 on unified ensemble land DA in SURFEX and outer loop coupling in HARMONIE-AROME

**CERRA2-Pv1 (M19-42):**

- Regional *ensemble* reanalysis demonstrator for a pan-European domain evolving on CARRA3-Pv1 with targetted spatial resolution of 3.75 km (7.5 km for ensemble members).
- The prototype will evolve on CARRA3-Pv1



Funded by  
the European Union

Coordinated by  
 ECMWF



# Thank you

ECMWF, MetNorway, SMHI, Météo-France, DWD, CMCC, BSC, MetOffice, DMI, ESTELLUS, IPMA, NILU

The CERISE project (grant agreement No 101082139) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Commission. Neither the European Union nor the granting authority can be held responsible for them."