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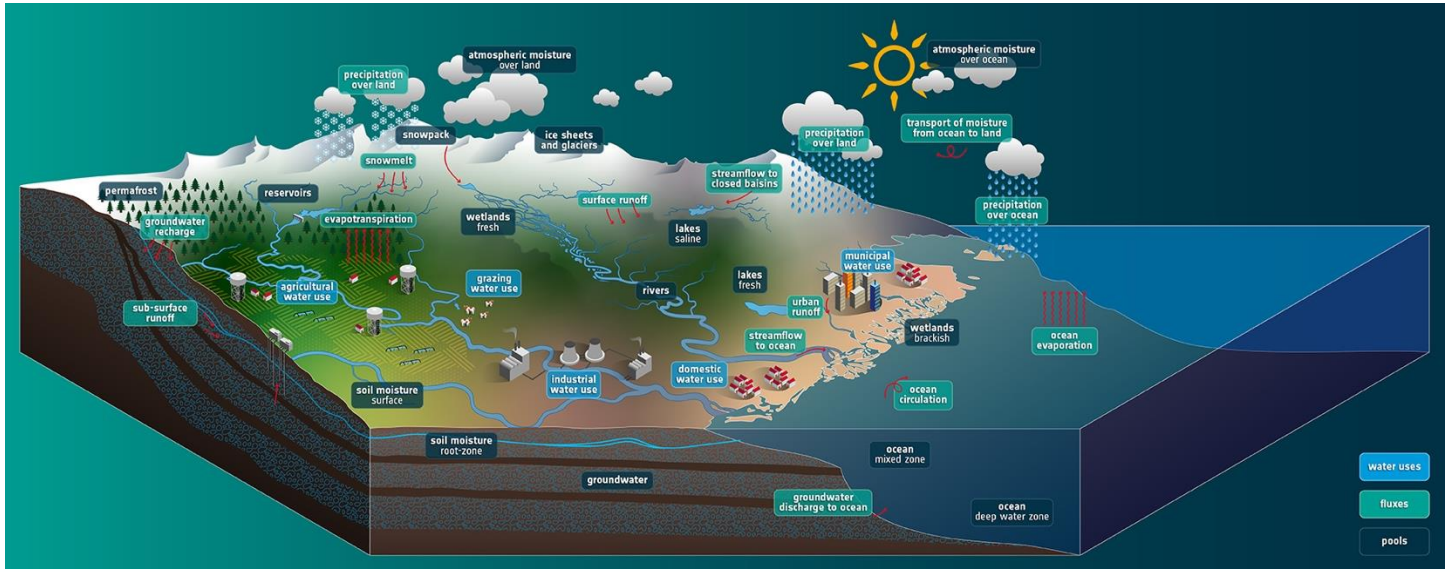
2+billion people affected by water stress

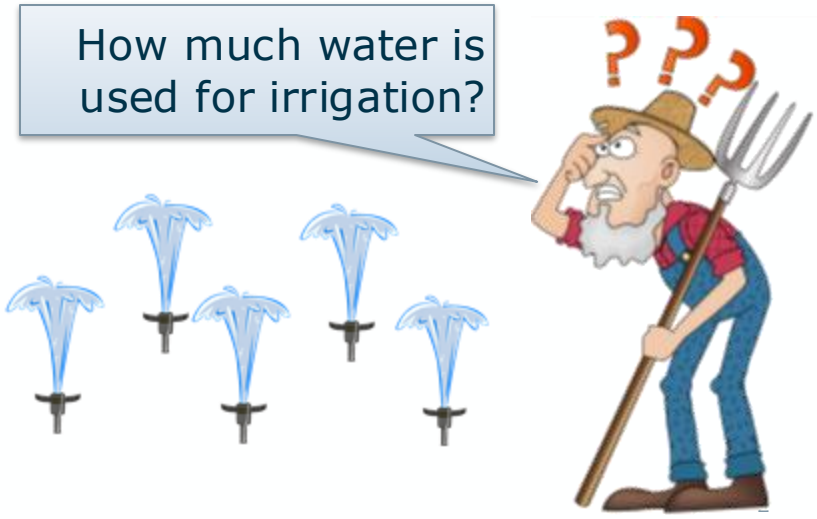
A number that will only increase with population growth, continued economic development and climate changing (United Nations, 2018)

The human impact has become a major component on the water cycle

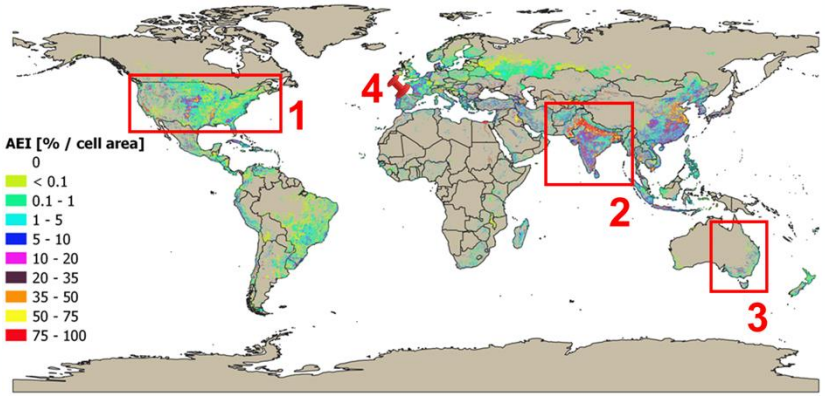


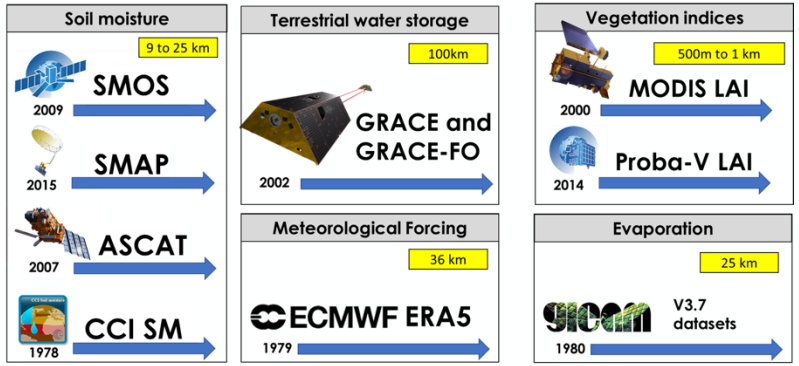
70% of the water withdrawn worldwide is for irrigation, the major water consumer of our planet

PROBLEM: Lack of ground data at field level, leading to unknown quantity of water used for irrigation in the past, present and future

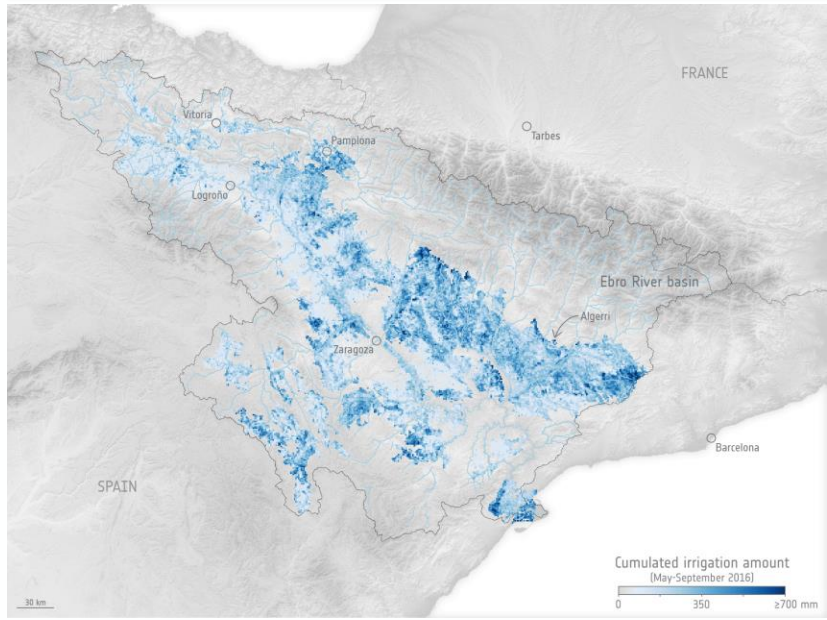


The overarching objective of the **Climate Change Initiative – Anthropogenic Water Use (CCI-AWU)** precursor project is to develop and validate long-term AWU time series (mainly consisting of agricultural water use) for four selected regions where detailed ground-based irrigation estimates are available.
Several approaches and algorithms using remote sensing observations will be considered, as a proof-of-concept towards a dedicated AWU ECV product.





The legacy of the **ESA Irrigation+** project, which developed advanced EO-based algorithms and techniques for irrigation mapping, quantification and detection from field to regional/global scale, is exploited.



WP310: SM-based inversion approach (UNIPG+CNR-IRPI)

WP 320: SM-based delta (TUWien)

WP 330: Flux-based approach (TUWien)

WP340: Data Assimilation (KULeuven+CNR-IRPI)

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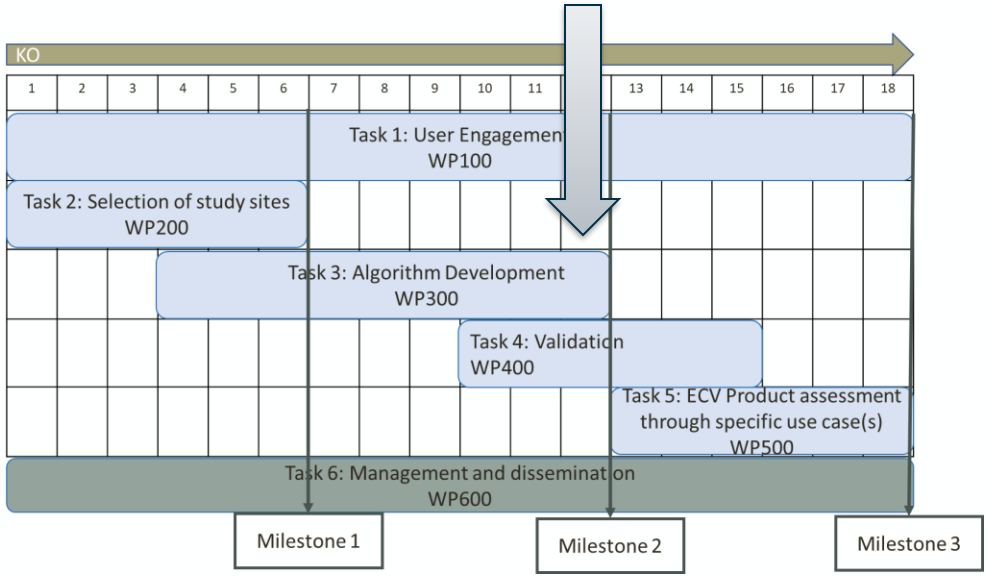
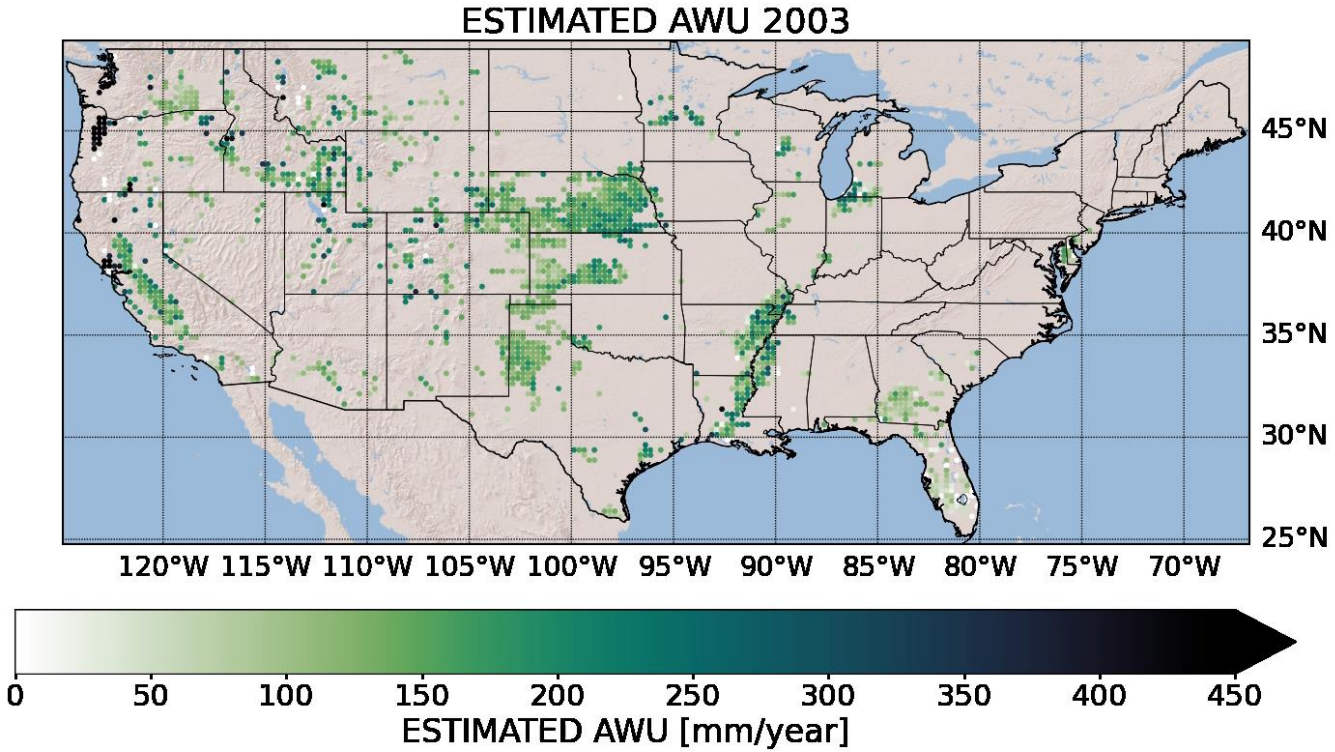
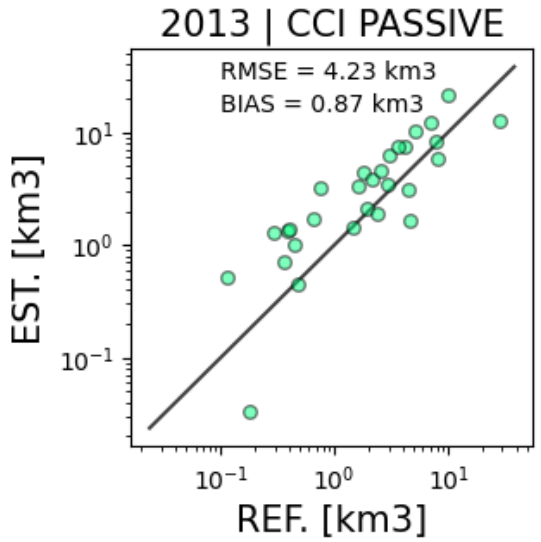
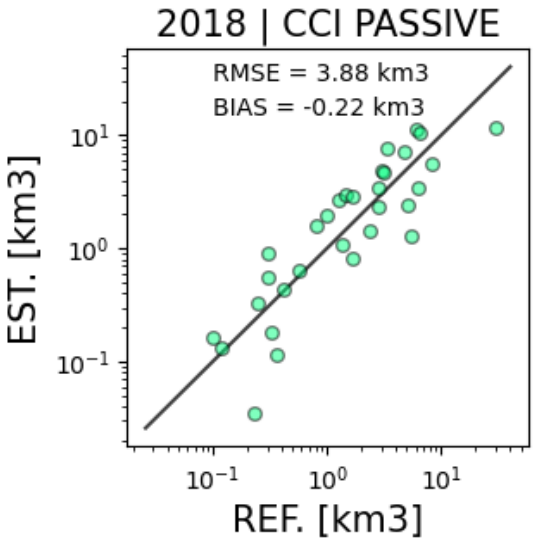
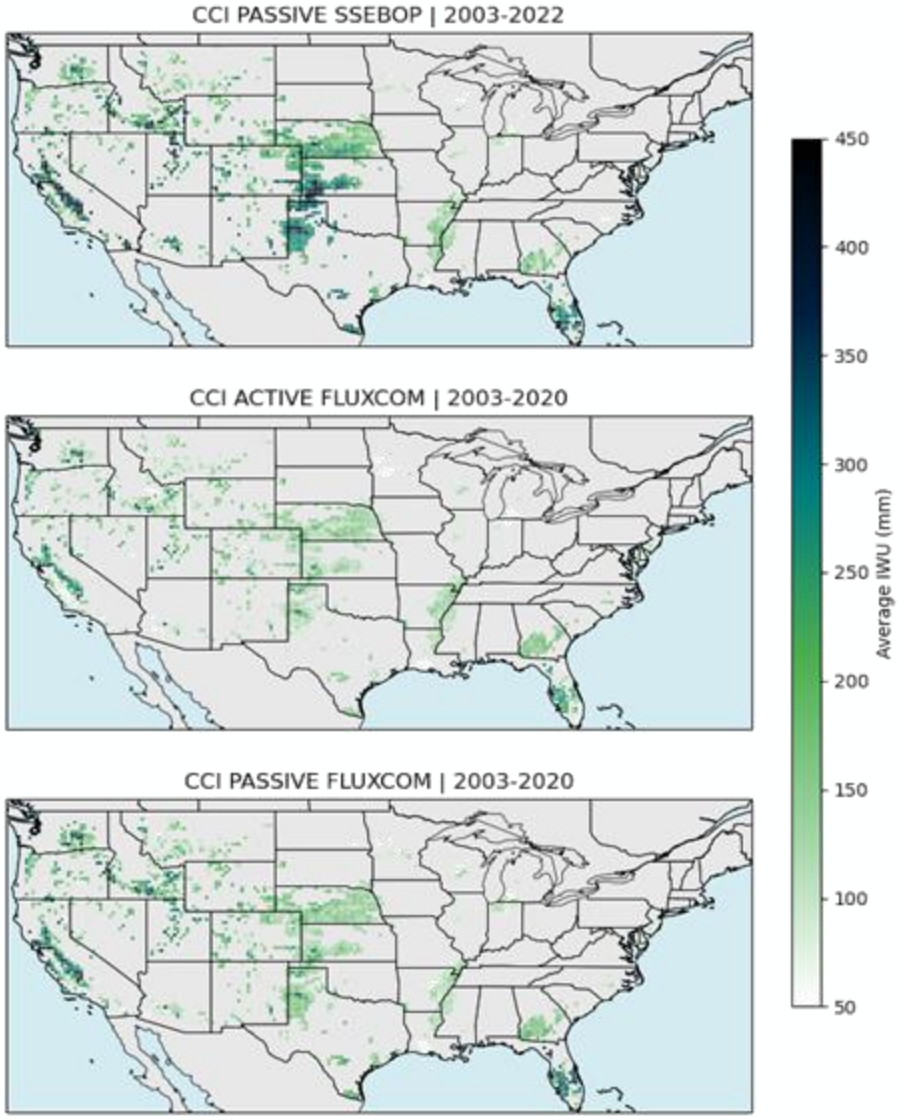


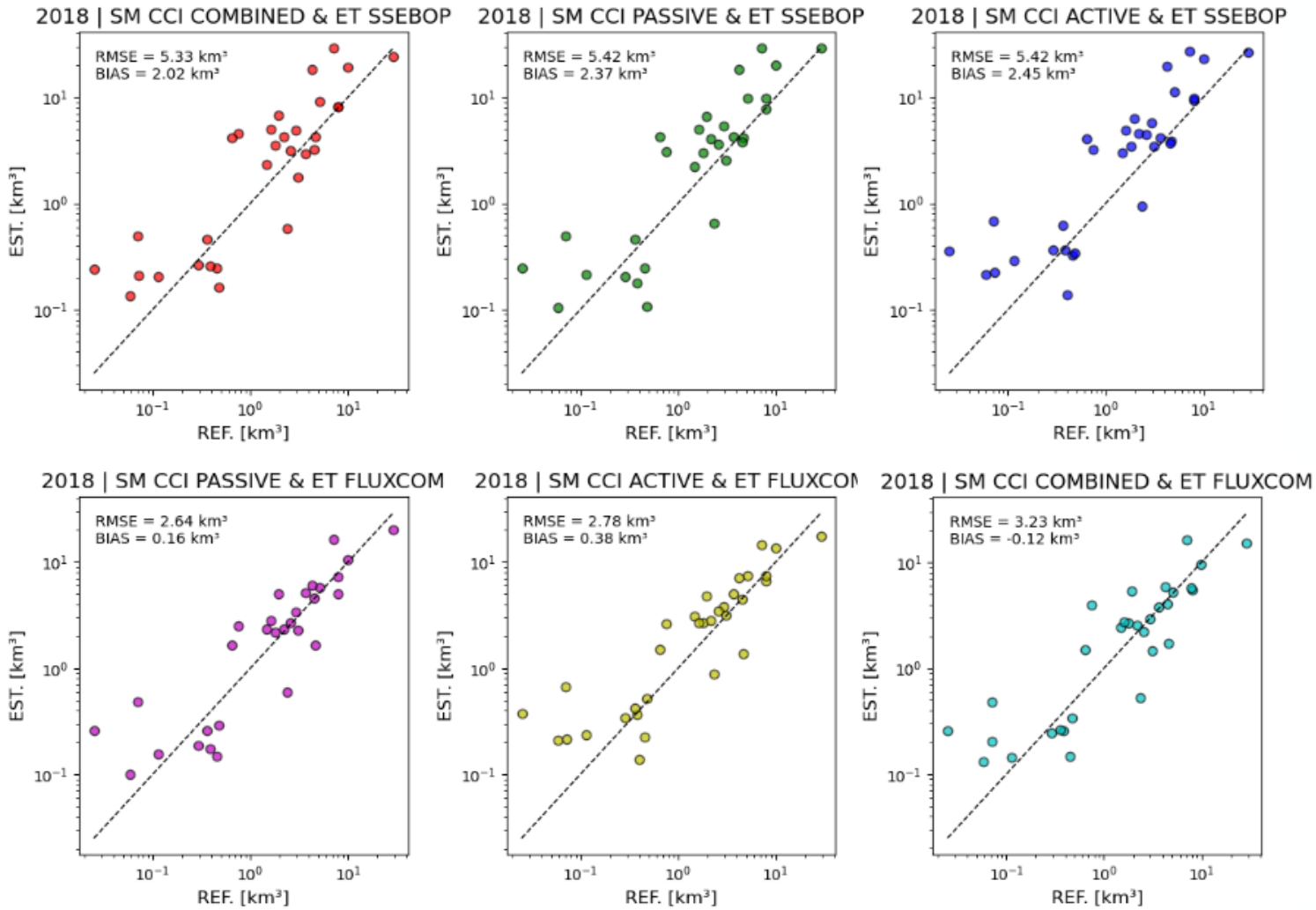




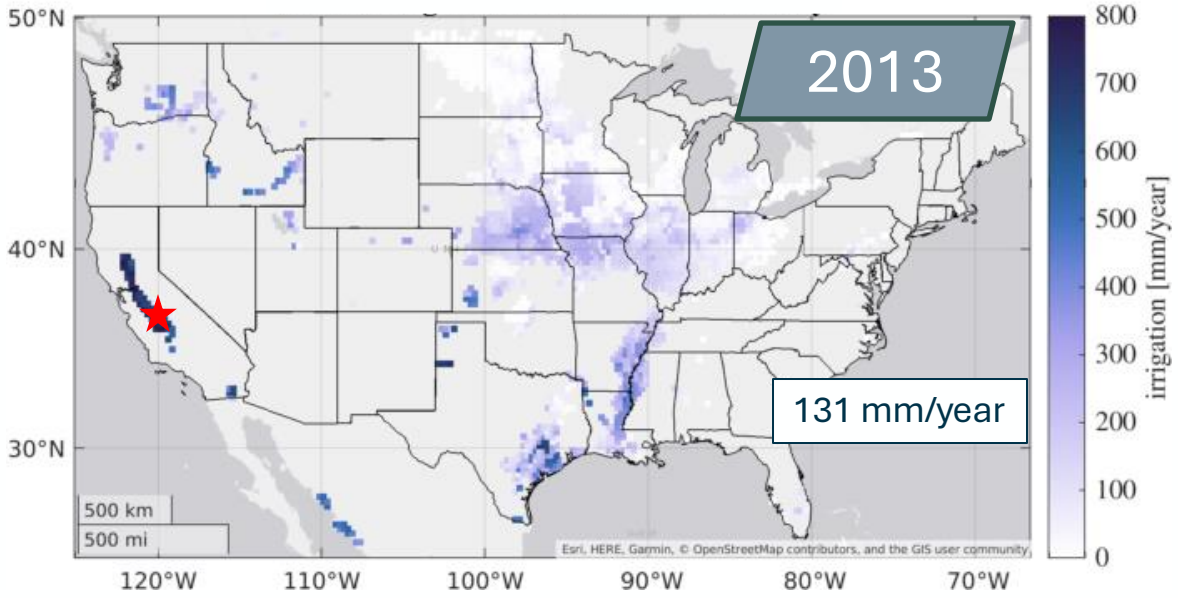


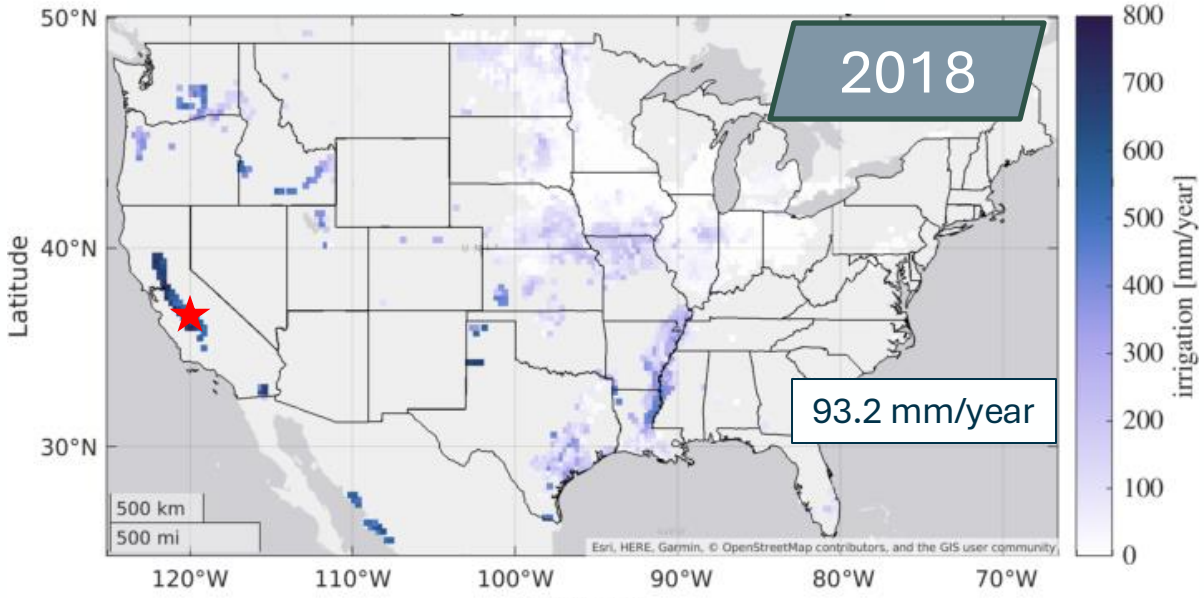
Results over the CONUS obtained leveraging **CCI PASSIVE** soil moisture


CCI PASSIVE SSEBOP | 2003-2022
CCI ACTIVE FLUXCOM | 2003-2020
CCI PASSIVE FLUXCOM | 2003-2020
Average iWU (mm)
450
400
350
300
250
200
150
100
50

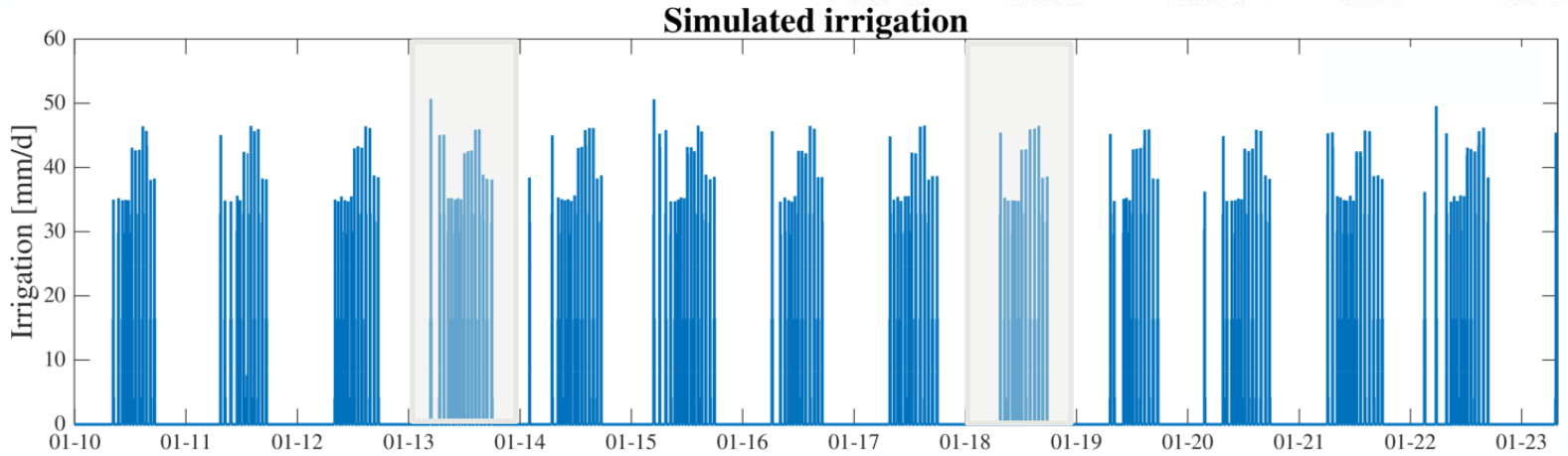

2018 | SM CCI COMBINED & ET SSEBOP
RMSE = 5.33 km³
BIAS = 2.02 km³
2018 | SM CCI PASSIVE & ET SSEBOP
RMSE = 5.42 km³
BIAS = 2.37 km³
2018 | SM CCI ACTIVE & ET SSEBOP
RMSE = 5.42 km³
BIAS = 2.45 km³
2018 | SM CCI PASSIVE & ET FLUXCOM
RMSE = 2.64 km³
BIAS = 0.16 km³
2018 | SM CCI ACTIVE & ET FLUXCOM
RMSE = 2.78 km³
BIAS = 0.38 km³
2018 | SM CCI COMBINED & ET FLUXCOM
RMSE = 3.23 km³
BIAS = -0.12 km³
EST. [km³]
REF. [km³]

Example maps of annual irrigation and long-term time series

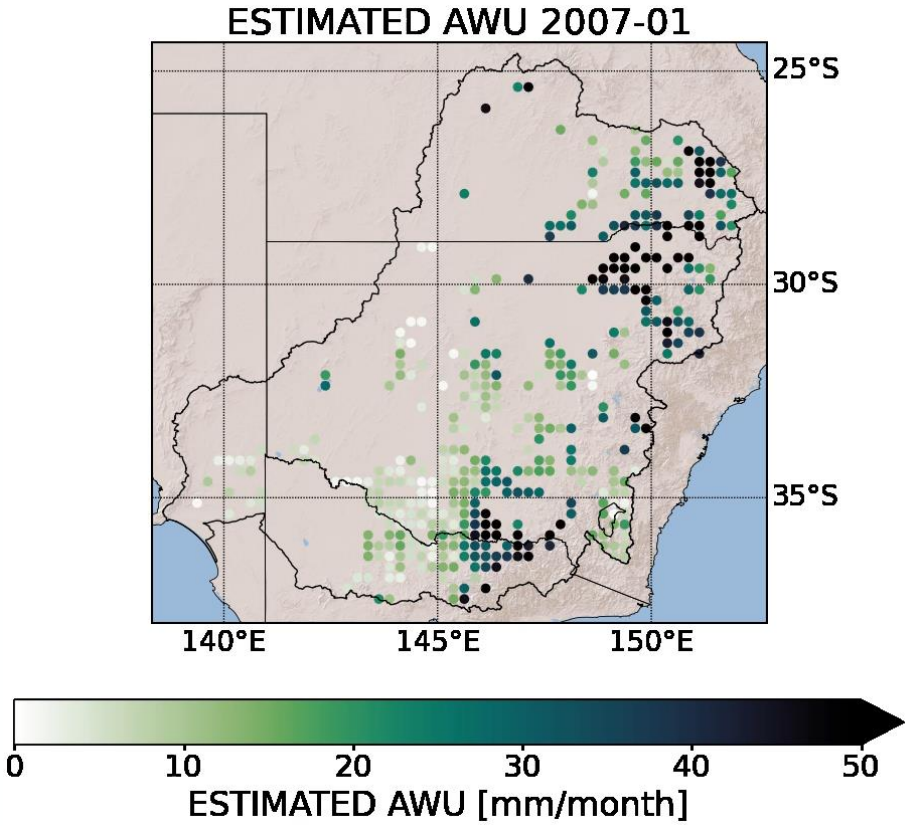


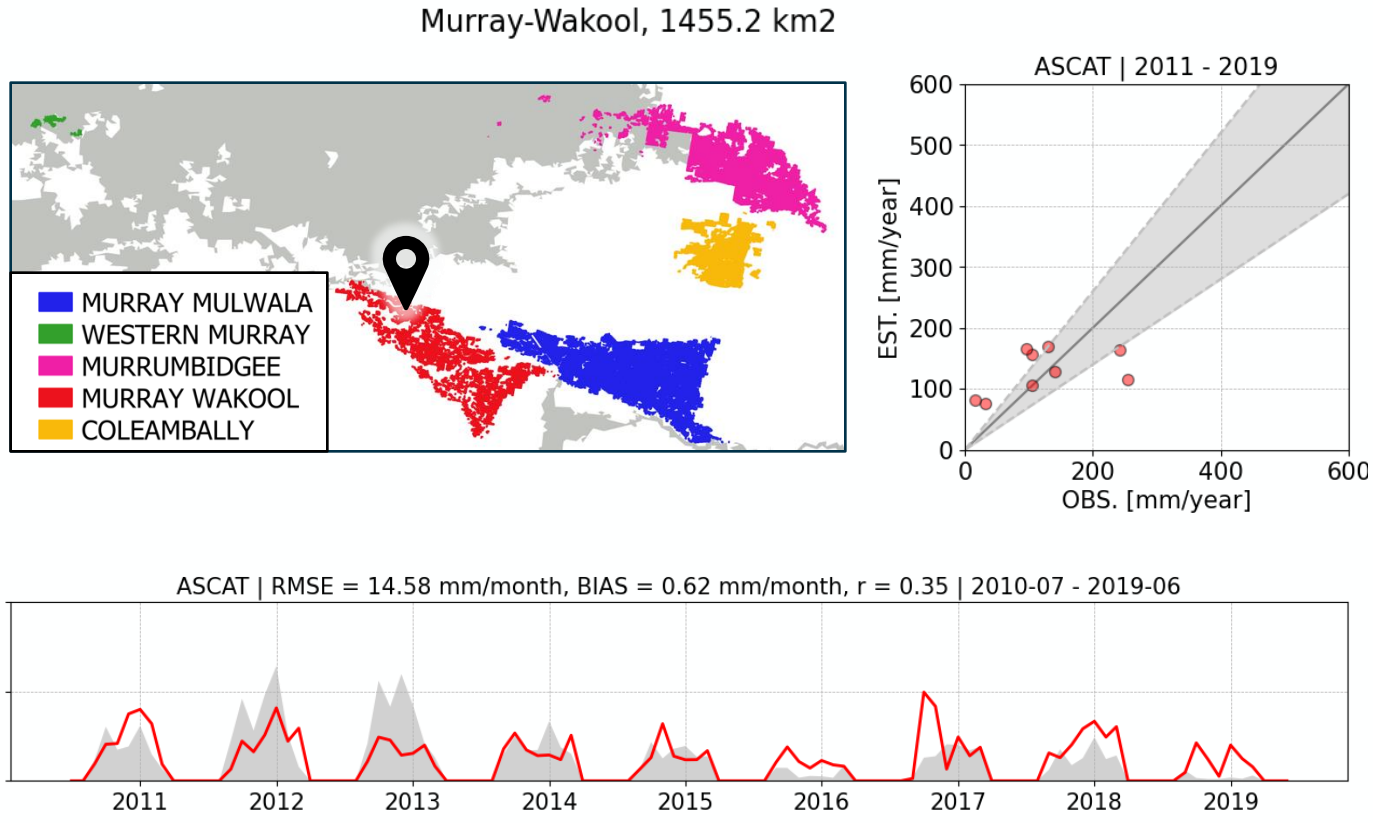


25km/daily spatio-temporal resolution

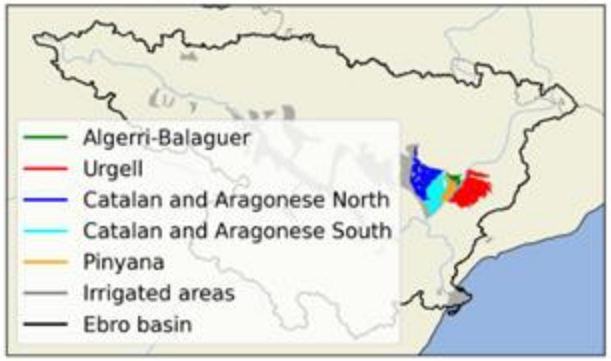


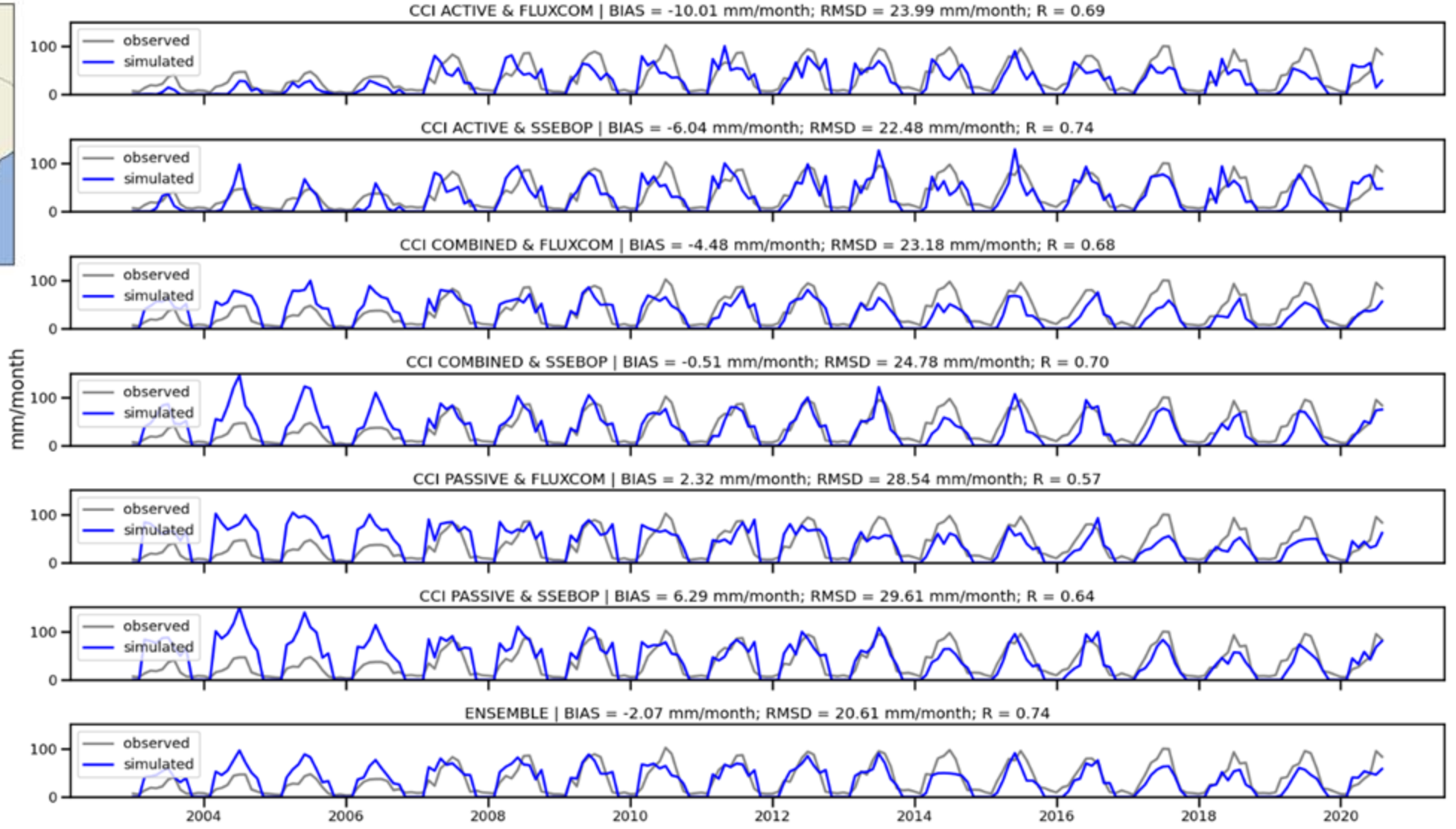
* Long-term (2010-2022) irrigation over an irrigated pixel in California





Results over the Murray-Darlin basin (Australia) obtained leveraging **ASCAT** soil moisture

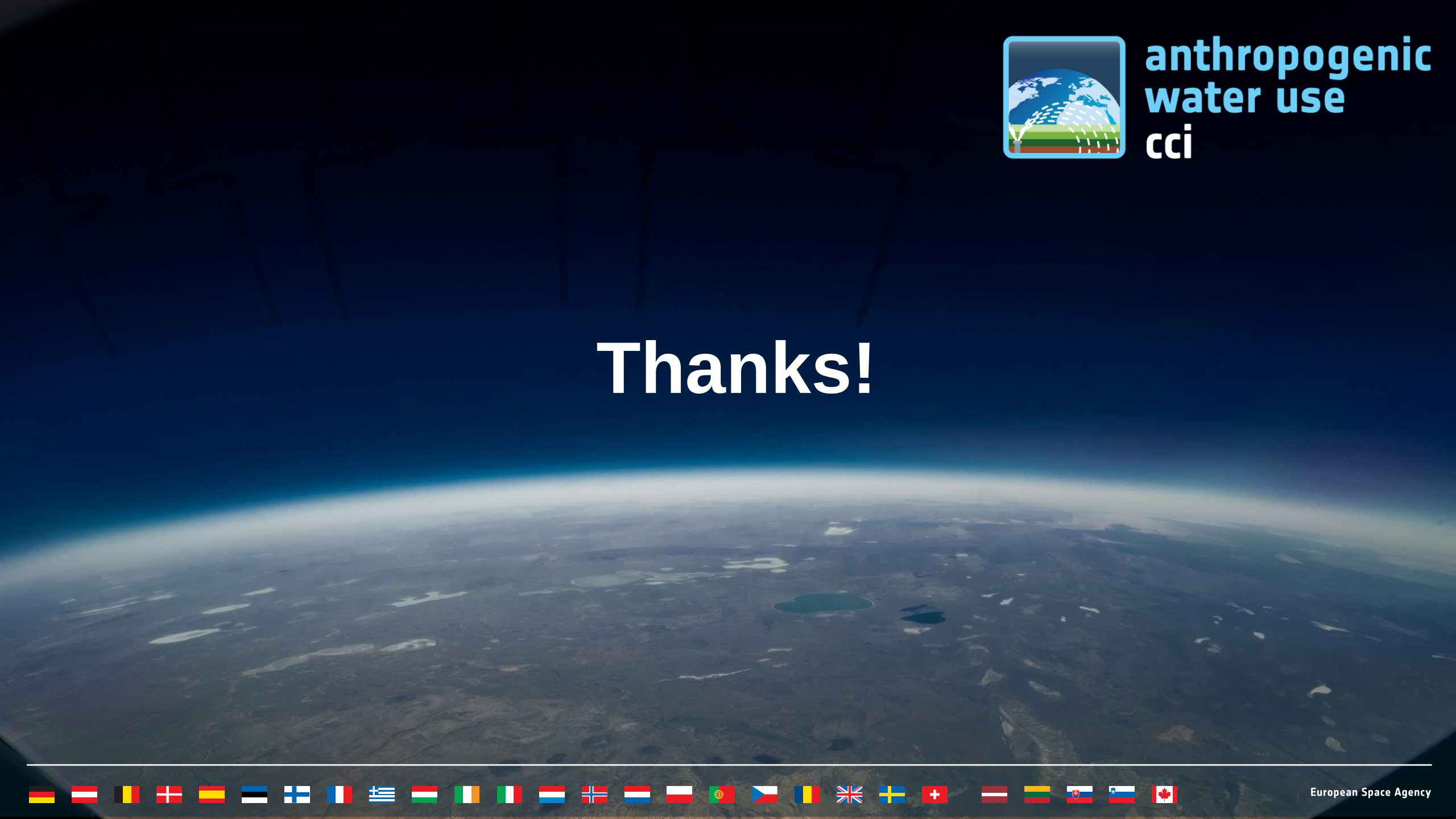

Algerri-Balaguer
Urgell
Catalan and Aragonese North
Catalan and Aragonese South
Pinyana
Irrigated areas
Ebro basin


CCI ACTIVE & FLUXCOM | BIAS = -10.01 mm/month; RMSD = 23.99 mm/month; R = 0.69
CCI ACTIVE & SSEBOP | BIAS = -6.04 mm/month; RMSD = 22.48 mm/month; R = 0.74
CCI COMBINED & FLUXCOM | BIAS = -4.48 mm/month; RMSD = 23.18 mm/month; R = 0.68
CCI COMBINED & SSEBOP | BIAS = -0.51 mm/month; RMSD = 24.78 mm/month; R = 0.70
CCI PASSIVE & FLUXCOM | BIAS = 2.32 mm/month; RMSD = 28.54 mm/month; R = 0.57
CCI PASSIVE & SSEBOP | BIAS = 6.29 mm/month; RMSD = 29.61 mm/month; R = 0.64
ENSEMBLE | BIAS = -2.07 mm/month; RMSD = 20.61 mm/month; R = 0.74
observed
simulated
mm/month
100
0
2004
2006
2008
2010
2012
2014
2016
2018
2020

Website
https://climate.esa.int/en/projects/anthropogenic-water-use/

Papers
Dari J, Morbidelli R, Quintana-Seguí, P and Brocca L (2024) The Temporal-Stability-Based Irrigation MAPping (TSIMAP) Method: A Virtuous Trade-Off between Accuracy, Flexibility, and Facility for End-Users. Water, Volume 16, Issue 5. https://www.mdpi.com/2073-4441/16/5/644

Presentations and posters
- Poster "CCI-AWU: precursor Project for Anthropogenic Water Use" at the 13th CCI colocation meeting
- Presentation at the MAGIC Workshop in Assisi on 2 November 2023
- Presentation at the NGGM MAG Meeting in ESTEC on 18 January 2024
- Presentation at the ESA EO4AGRI 2024 Workshop: https://eo4agri2024.esa.int/
- Presentation at the DTE Hydrology Webinar: https://www.youtube.com/watch?v=VlFMXvvPTb8
- Presentation at the Hydroterra+ MAG Meeting in ESTEC on 23 July 2024


anthropogenic
water use
cci
Thanks!
European Space Agency