



WORLD CLIMATE RESEARCH PROGRAMME

42nd Session of the WCRP Joint Scientific Committee (JSC42)

WCRP Grand Challenges

Water for the Food Baskets of the world



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Human imprint on the water cycle

Rodell et al. used GRACE to identify some regions where human activities modified water stores and other where the climate was the driver.

Trends in the parameter: **non climatic trends**
(positive / negative / not significant)
 (significantly different from trends in climatic parameter)

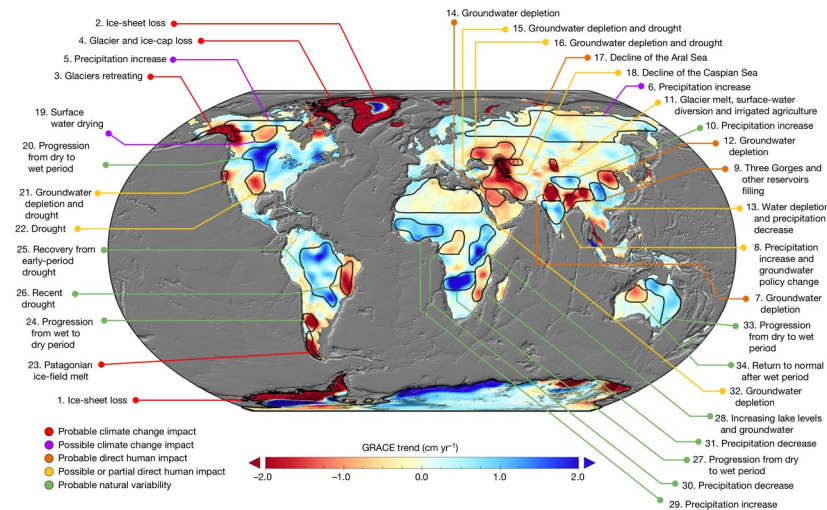
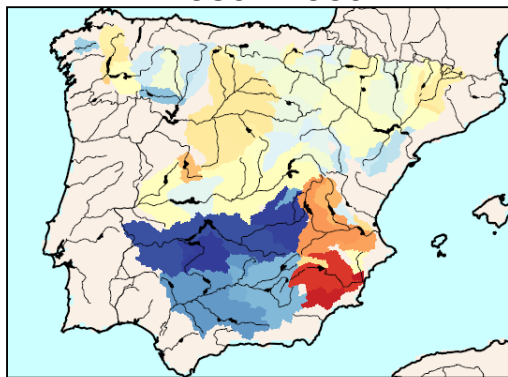


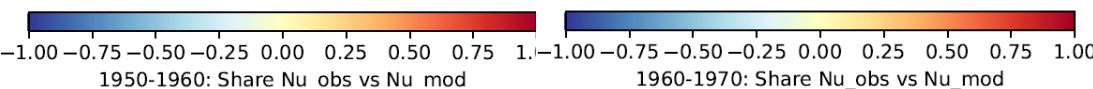
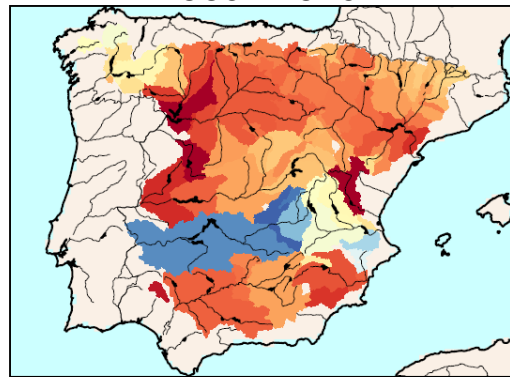
Fig. 1 | Annotated map of TWS trends. Trends in TWS (in centimetres per year) obtained on the basis of GRACE observations from April 2002 to March 2016. The cause of the trend in each outlined study region is briefly explained and colour-coded by category. The trend map was smoothed

with a 150-km-radius Gaussian filter for the purpose of visualization; however, all calculations were performed at the native 3° resolution of the data product.

1950 - 1960



1960 - 1970



Collignan et al. showed how water management modifies the functioning of catchments beyond what can be explained by climate change.

Climate vs Human Attribution

- WCRP has a responsibility to advance the attribution of these two factors which modify the continental water cycle.
 - *Climate & water management modify floods and droughts !*
 - *Is there interest from the Explaining and Predicting LHA ?*
- **To make progress we need to be able to predict the managed continental water cycle.**
- Should this be encouraged by promoting a transition from LUMIP to WUMIP ?
- Would a “Water Use Model Inter-comparison Project” be global or regional ?
 - *High resolutions are needed to represent human infrastructures and their impacts.*
 - *How likely is it that water usage impacts the global climate ?*
 - *Would CORDEX be interested to move in this direction ?*
 - *Would CLIVAR, with their new interest in coastal processes, be interested in source of change of continental freshwater ?*

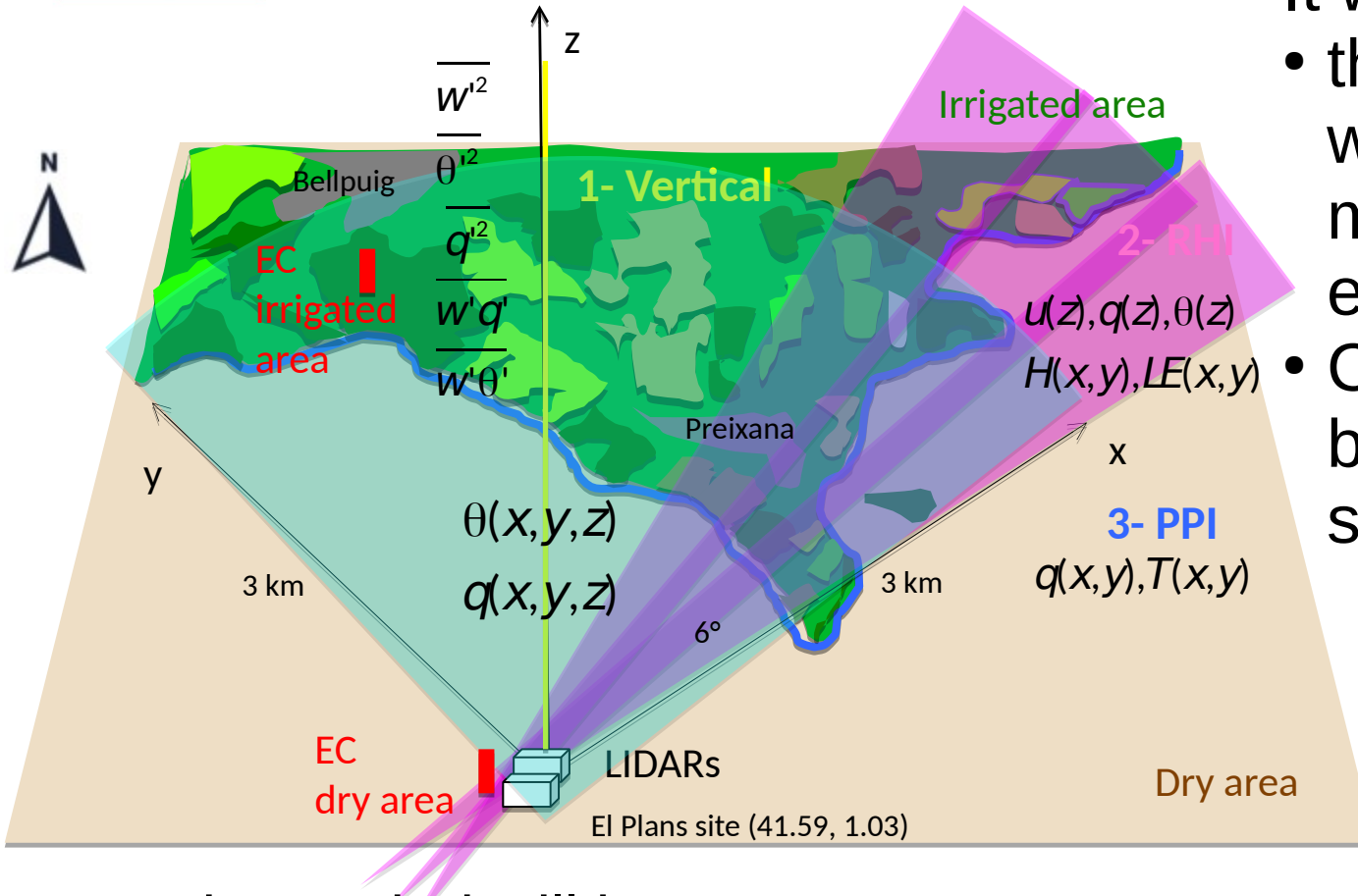


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It will focus on :

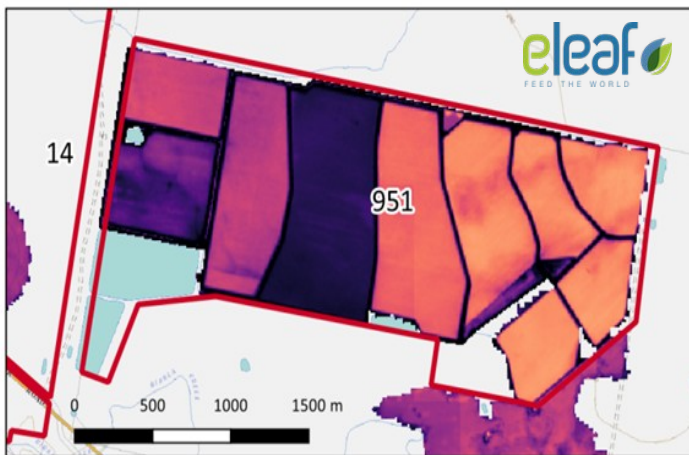
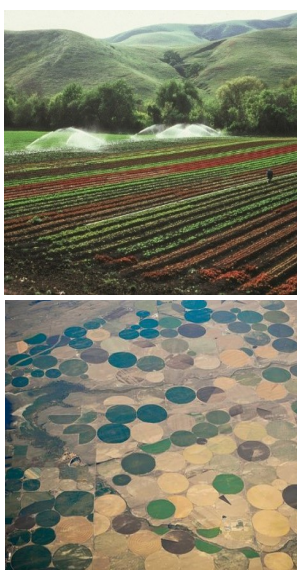
- the impact of water management on evaporation,
- Changes in the boundary layer structure.



Intensive period will be from 15-31st of July.

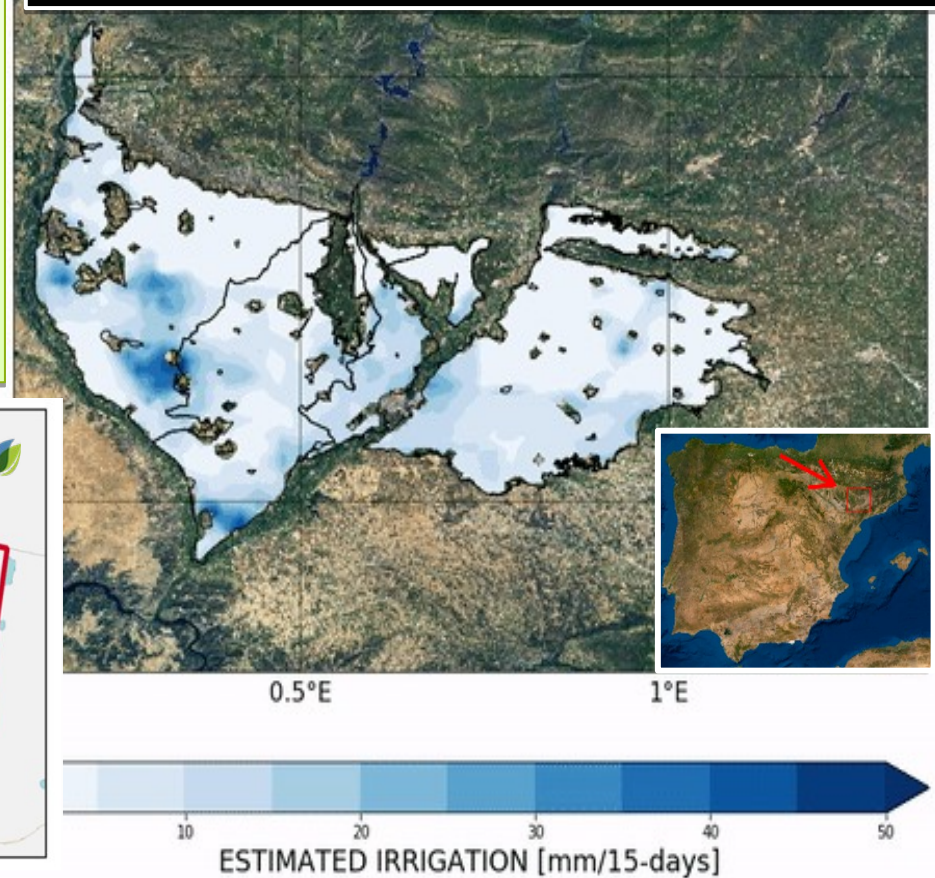
Irrigation monitoring

The **IRRIGATION+** ESA project aims to explore, develop and validate advanced EO-based algorithms and techniques for irrigation mapping, quantification and detection of seasonal timing of irrigation from field to regional/global scale.



Evaporation anomalies caused by irrigation.

Irrigation water use at 1km/15 day resolution (2011-2017) exploiting @ESA SMOS soil moisture



Including irrigation into ESMs

GEWEX has brought together GHP and GLASS to evaluate how well the geophysical drivers for irrigation can be predicted.

- Soil moisture stress is part of LSMs but is it a good predictor for actual irrigation ?
- Are there other factors (vegetation state, ...) needed ?

The next step is to determine if land surface models can predict the source of the water used for irrigation :

- Which river or reservoir will provide the needed water ?
- Will groundwater be pumped ?

Can all sources of irrigation water be integrated while keeping a closed water balance ?

Finally we need to interact with agronomers and economists to determine if and how the irrigation will be applied.



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The future of this Grand Challenge

This GC should be integrated into GEWEX and its panels :

- GLASS and GHP : They are already active and encouraging modelling studies on irrigation.
- GASS : Impact of man-made heterogeneities on boundary layer processes and the role of surface water transport ?
- GDAP : How far do the various observational products represent the natural or actual state of the continental water cycle ?
- Should there be some cross-panel coordination within the Evaporation theme ?

All LHAs probably need our expertise on these topics !

With WCRP we need to build bridges between water availability and water scarcity.



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