Food and Agriculture Organization of the United Nations

WaPOR

FAO's portal to monitor Water Productivity through Open-access of Remotely sensed derived data

Validating WaPOR data

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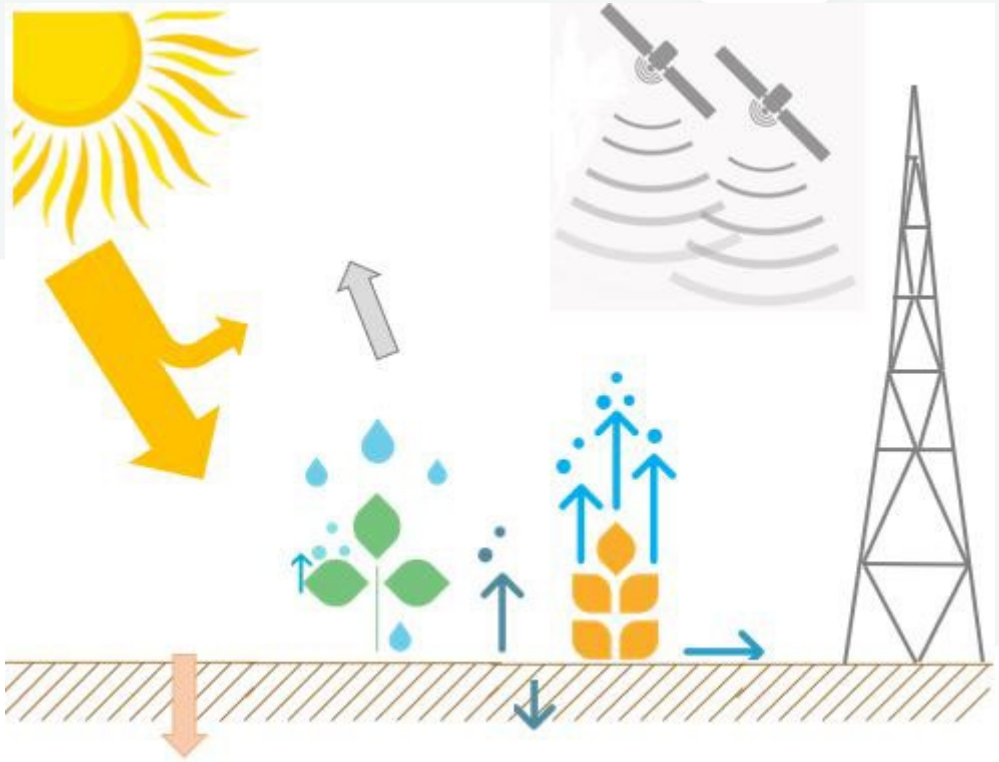
IWMI International Water Management Institute

IHE DELFT Institute for Water Education under the auspices of UNESCO

WaPOR data validation

Type of validations

- Validation against ground stations (PCP, RET and AETI)
- Comparison to auxiliary data
    - water balance (PCP, AETI)
    - yield (NPP)
    - kc (RET/ AETI)
- Comparison with other data products:
    - Eg MODIS, GLDAS, GLEAM, literature

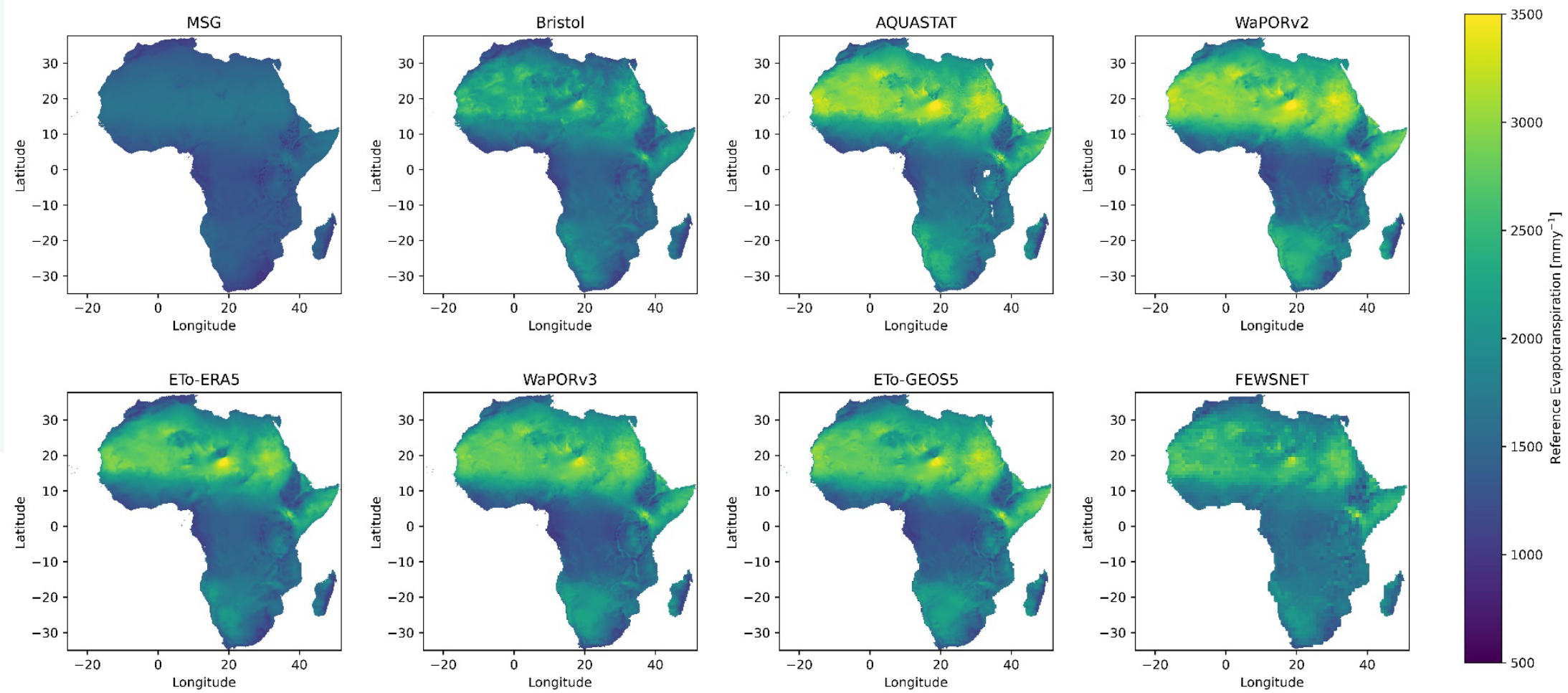


Validation data overview

WaPOR layer	In-situ data	Temporal resolution*	Auxiliary data
Reference ET	Weather station data (incl humidity, solar radiation, windspeed, temperature)	Daily or more frequent	
Actual ET	Eddy covariance, lysimeter, Bowen ratio, Scintillometer, surface renewal, advection-aridity, combinatory method (https://doi.org/10.5194/hess-27-4505-2023-supplement)	Daily or more frequent	Field or section scale soil water balance, catchment water balance
E (open water)	evaporation pan	Daily or more frequent	
T	Eddy covariance (ET partition), sapflow	Daily or more frequent	
NPP	Eddy covariance	Daily or more frequent	Seasonal biomass production, yield (and crop type coefficients)
RSM	Soil moisture measurements	Daily or more frequent	Field or section scale soil water balance

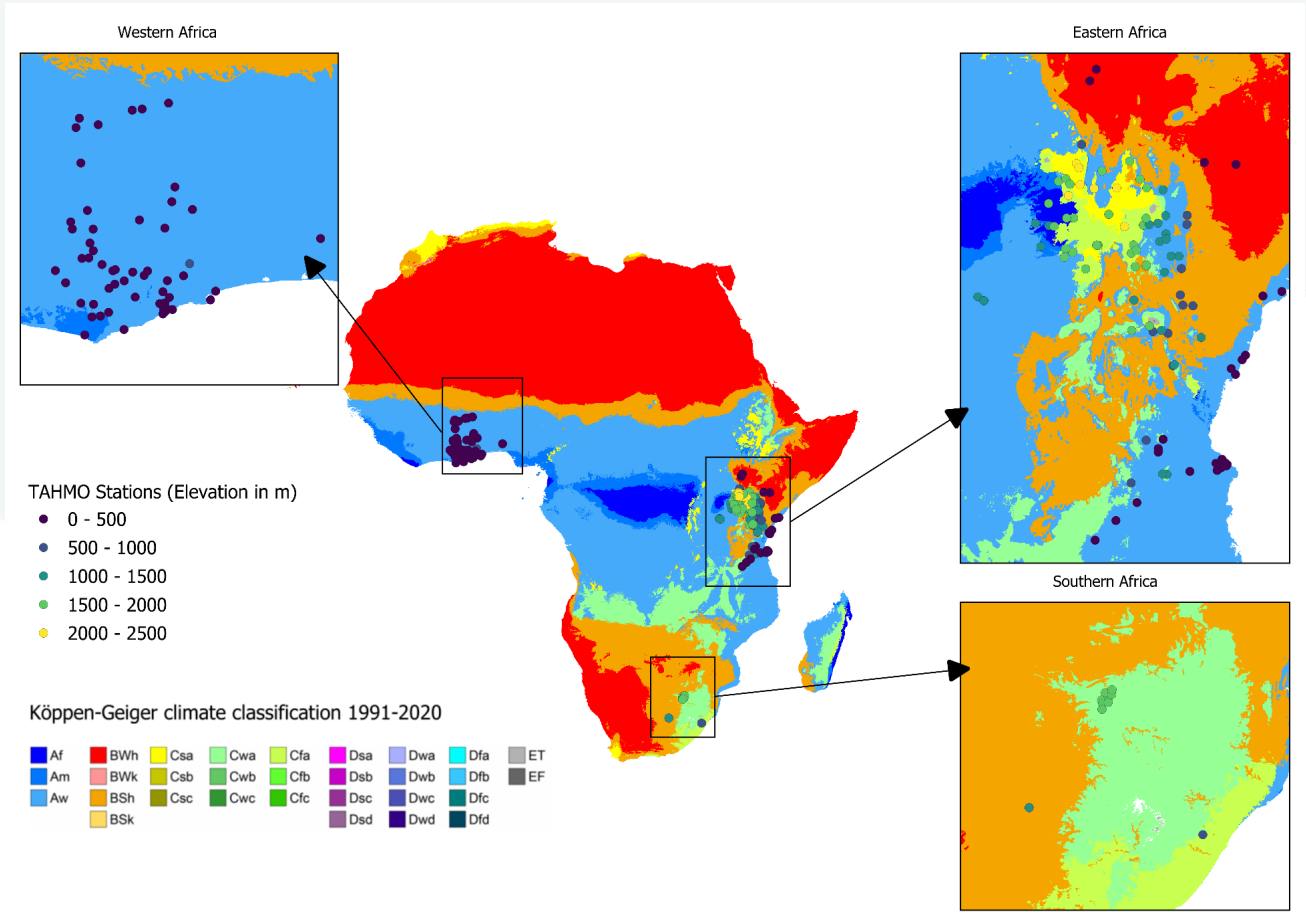
WaPOR RET data validation

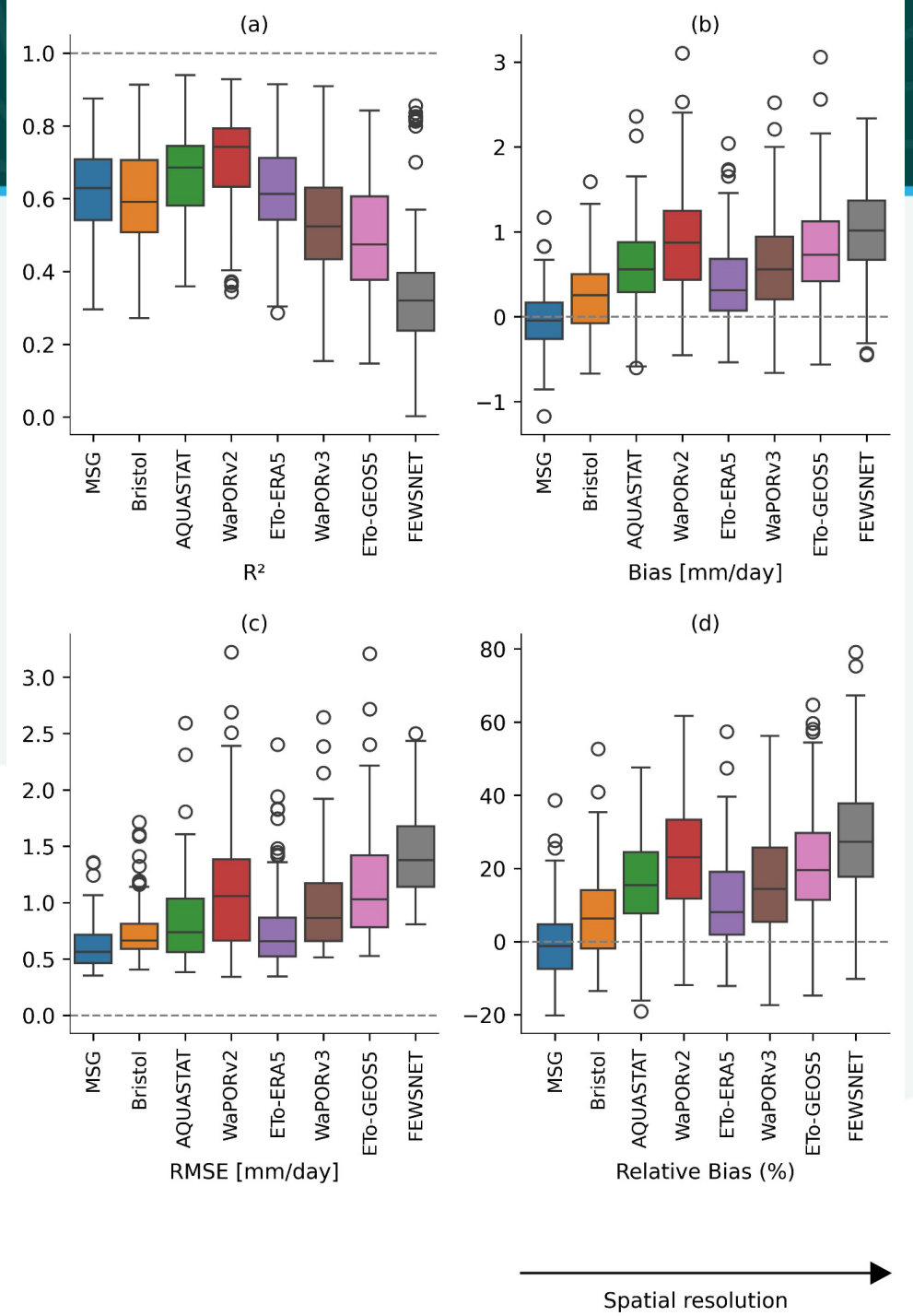
Comparison different products



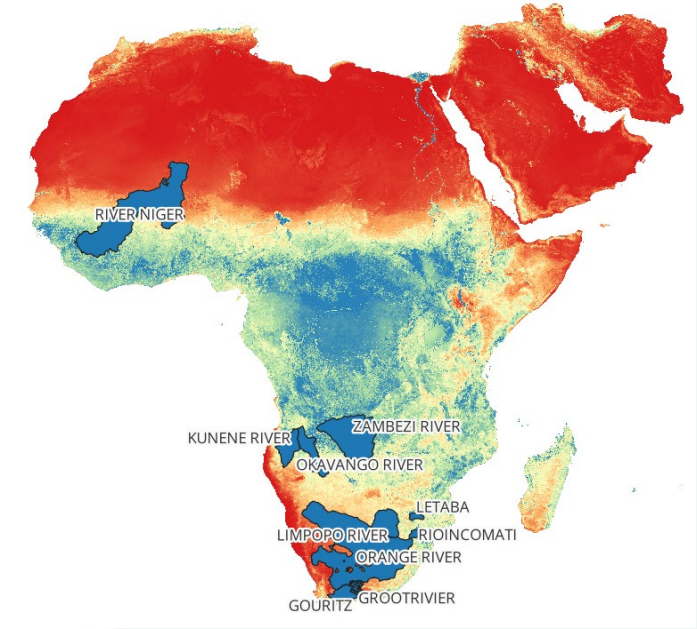
WaPOR RET data validation

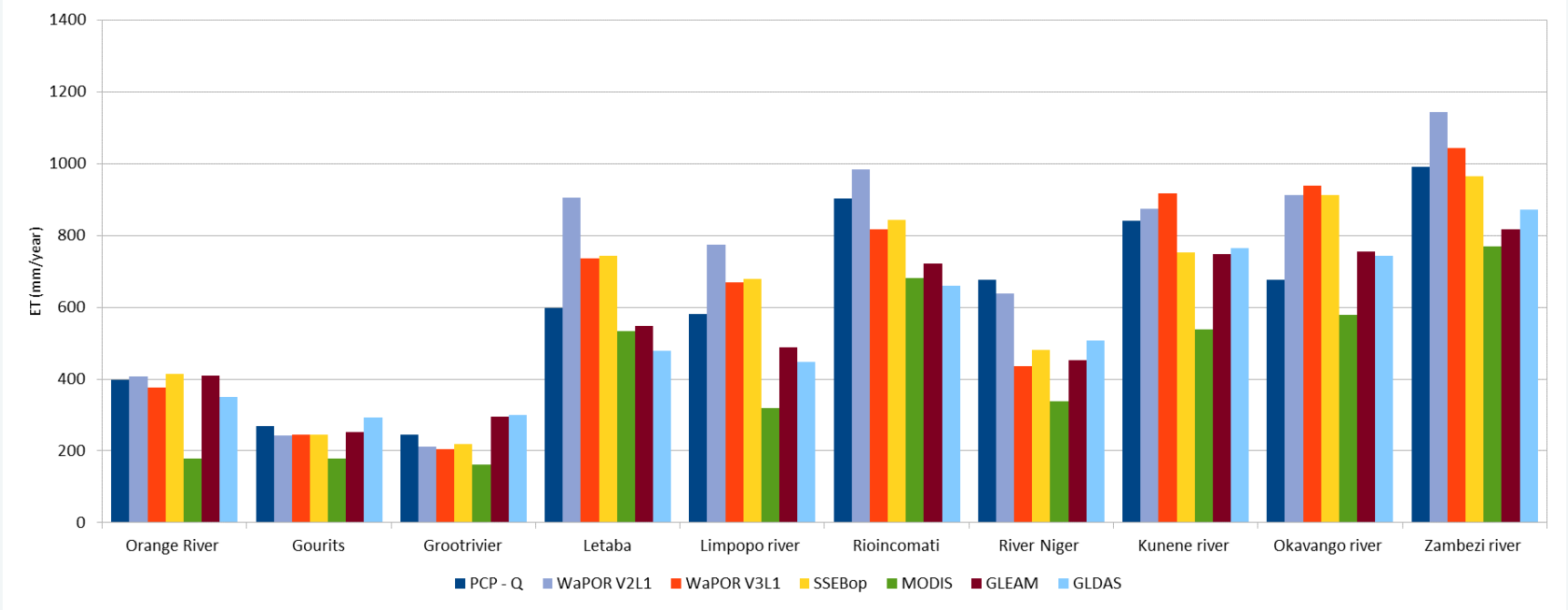
Tahmo 165 climate stations





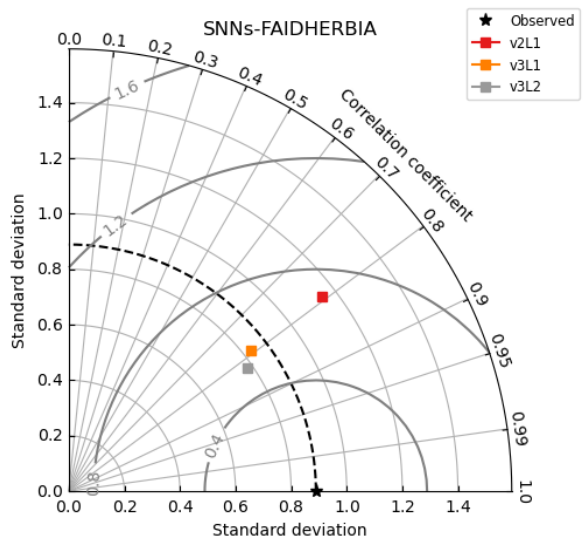
Water balance (AETI validation)

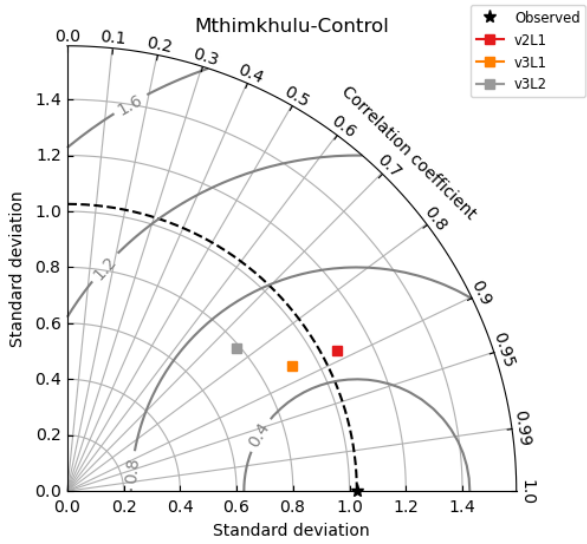


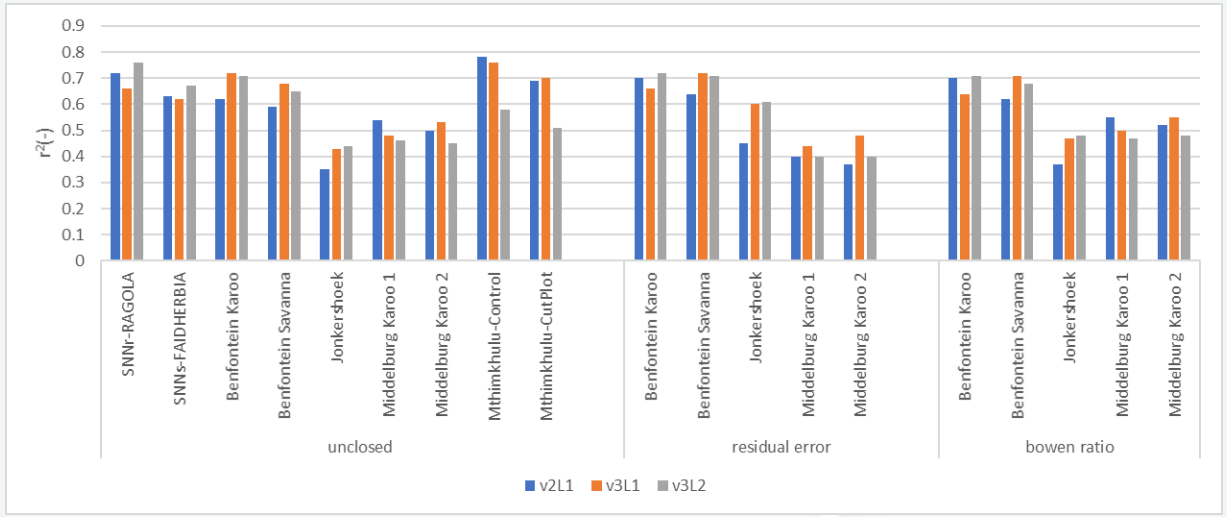


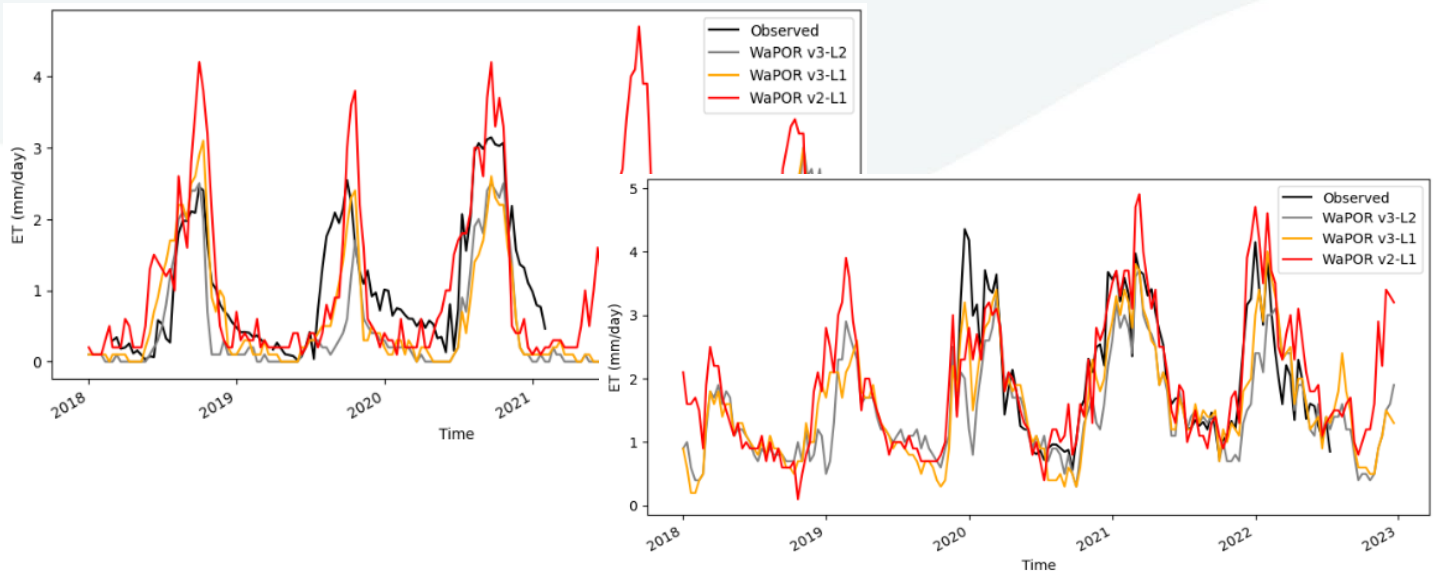
	P-Q	WaPOR v2L2	WaPOR v3L1	SSEBop	MODIS	GLEAM	GLDAS
Mean	618	585	638	628	428	554	524
Weighted average	614	515	560	571	365	522	500
r^2		0.81	0.80	0.78	0.84	0.85	0.89
Bias		33	20	10	-190	-64	-96
Rel bias		5%	3%	2%	-31%	-10%	-16%

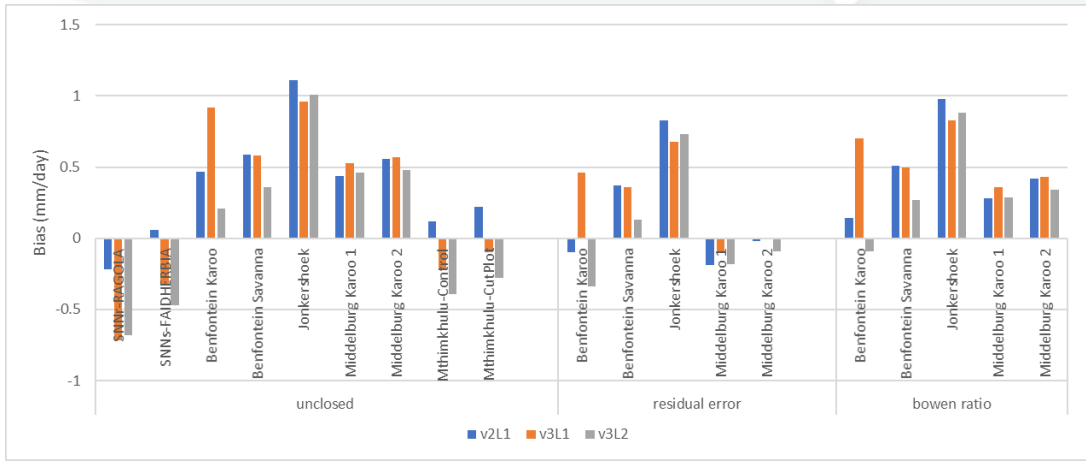
AETI validation with EC stations











AETI in cropland

WaPOR V2 –L2 AETI (mm/yr)

WaPOR V3-L2 AETI (mm/yr)

WaPOR difference V3-L2 – V2-L2 AETI (mm/yr)

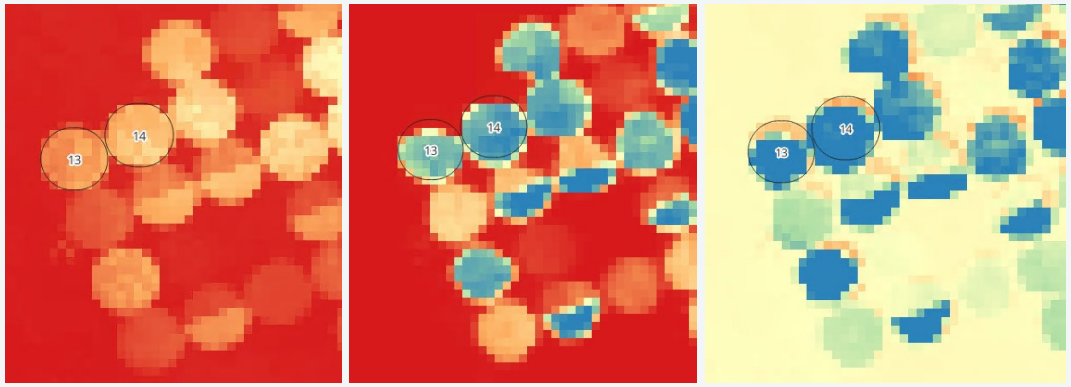
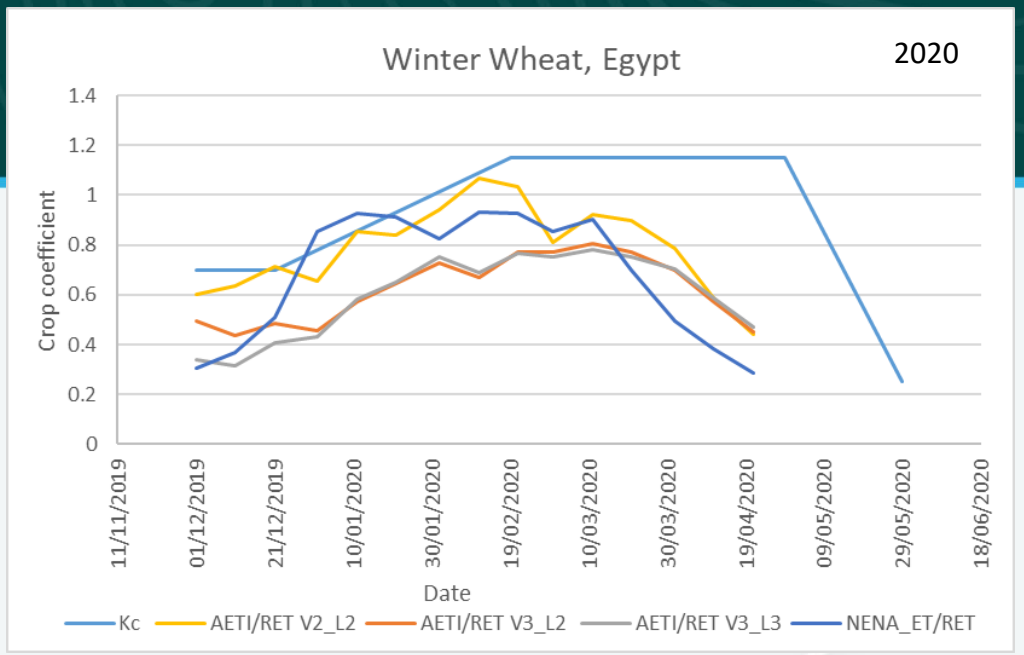
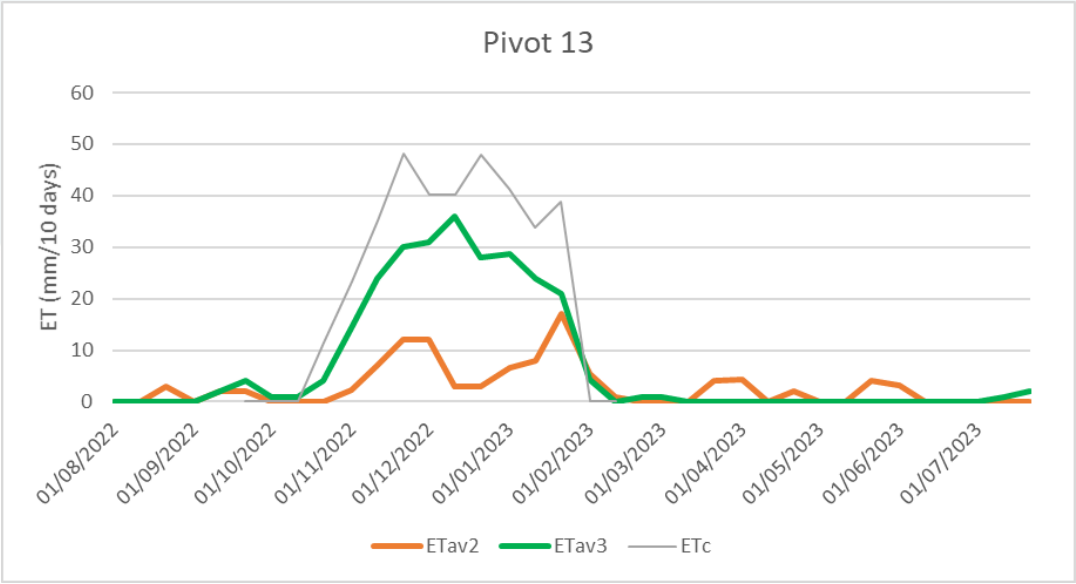
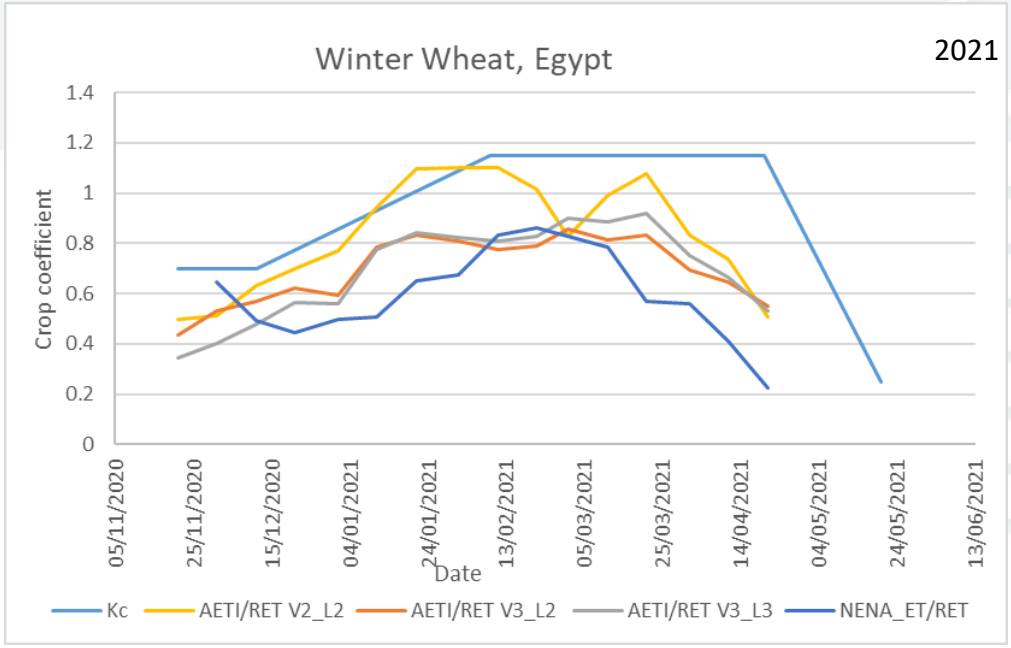


Figure 1 annual WaPOR AETI for selected centre pivots in El Oweinat in Egypt in mm/year for 2022





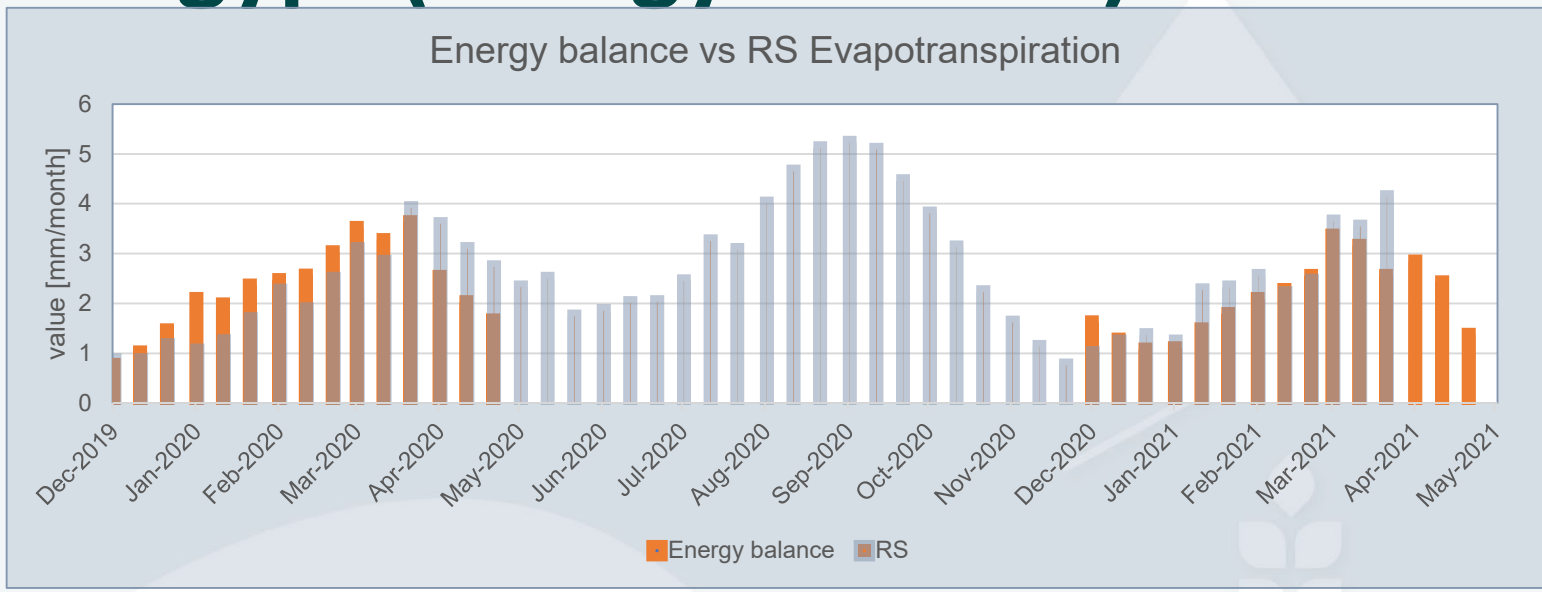
Centre pivots in Egypt

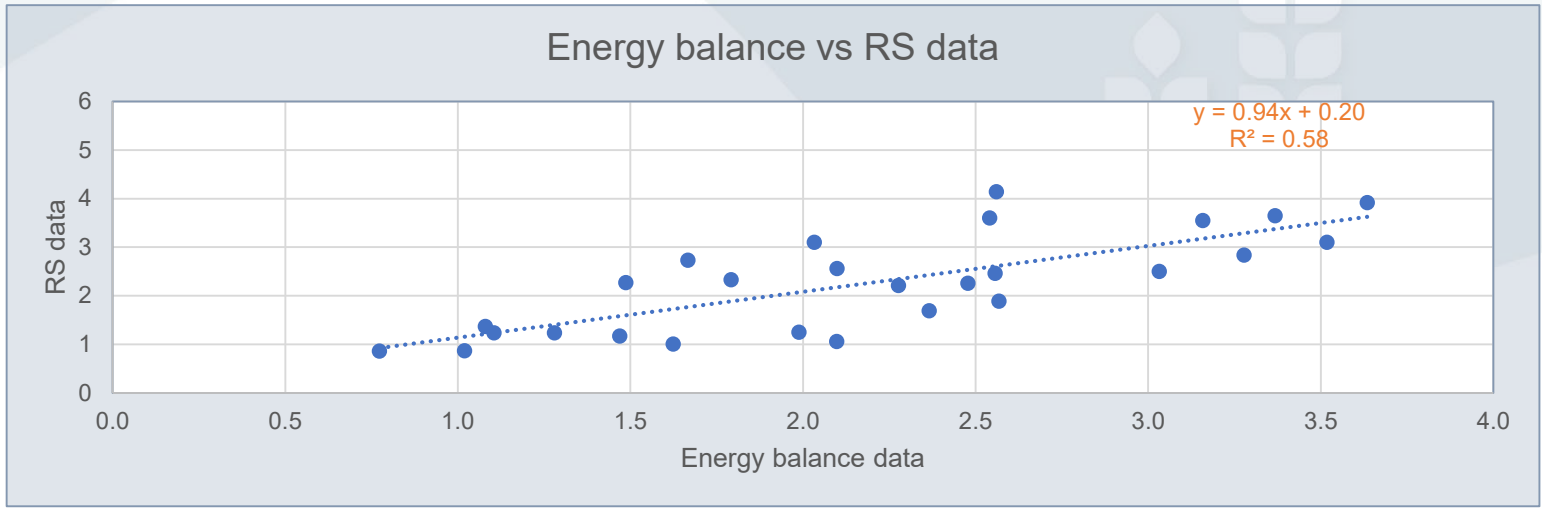


Crop coefficient during cropping stages (Nile Delta)

Validation Sakha station Egypt (energy balance)

Average	2.6
Number of data points	50
Evaluation metrics	
Pearson's correlation coefficient (CC)	**0.79**
Coefficient of determination (R2)	**0.63**
Nash-Sutcliffe Efficiency (NSE)	**0.62**
Kling-Gupta Efficiency (KGE)	**0.74**
Bias	**-0.08**
PBIAS	**-3.1**
Root mean square error (RMSE)	**0.78**
Mean Absolute error (MAE)	**0.57**





Validation data overview

WaPOR layer	In-situ data	Temporal resolution*	Auxiliary data	Data to collect if available (2018-2025)
Reference ET	Weather station data (incl humidity, solar radiation, windspeed, temperature)	Daily or monthly		Climate stations
Actual ET	Eddy covariance, lysimeter, Bowen ratio, Scintillometer, surface renewal, advection-aridity, combinatory method (https://doi.org/10.5194/hess-27-4505-2023-supplement)	Daily or monthly	Field or section scale soil water balance, catchment water balance	Eddy Covariance Discharge data
E (open water)	evaporation pan	Daily or monthly		E-pan
T	Eddy covariance (ET partition), sapflow	Daily or monthly		Sap flow / Eddy covariance
NPP	Eddy covariance	Daily or monthly	Seasonal biomass production, yield (and crop type coefficients)	Yield data (regional stats or field data)
RSM	Soil moisture measurements	Daily or monthly	Field or section scale soil water balance	Field data collection

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