



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

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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)
 - k_c (RET/ AETI)
- Comparison with other data products:
 - Eg MODIS, GLDAS, GLEAM, literature

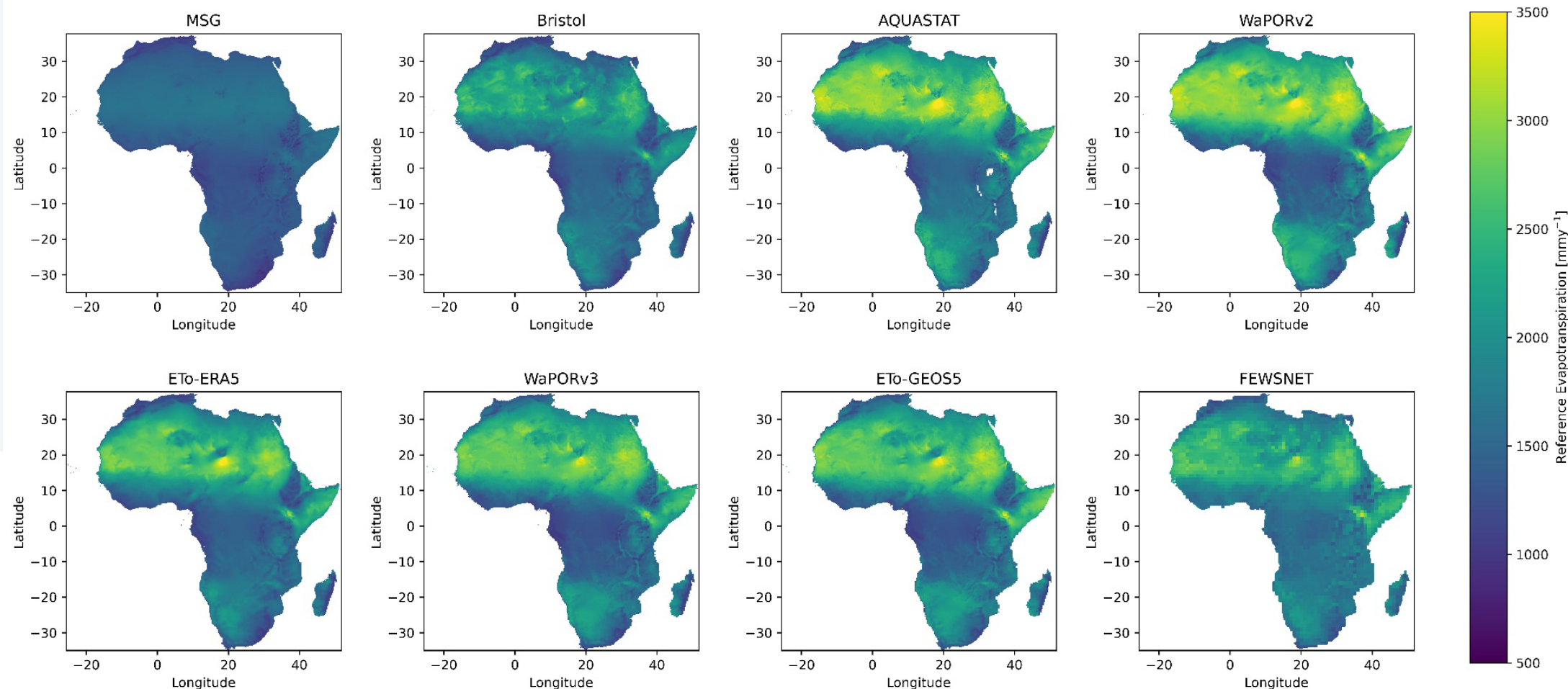


Validation data overview

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

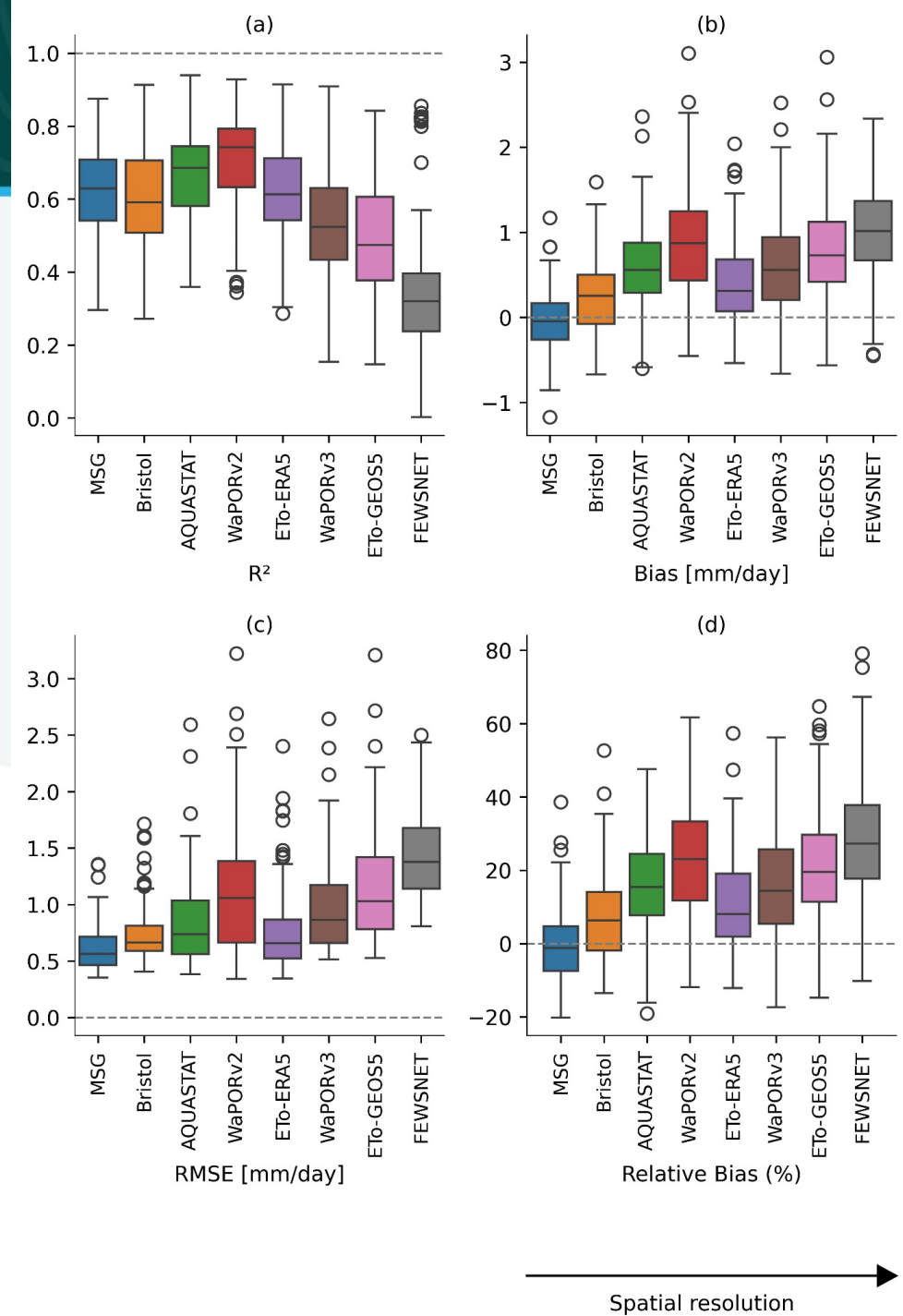
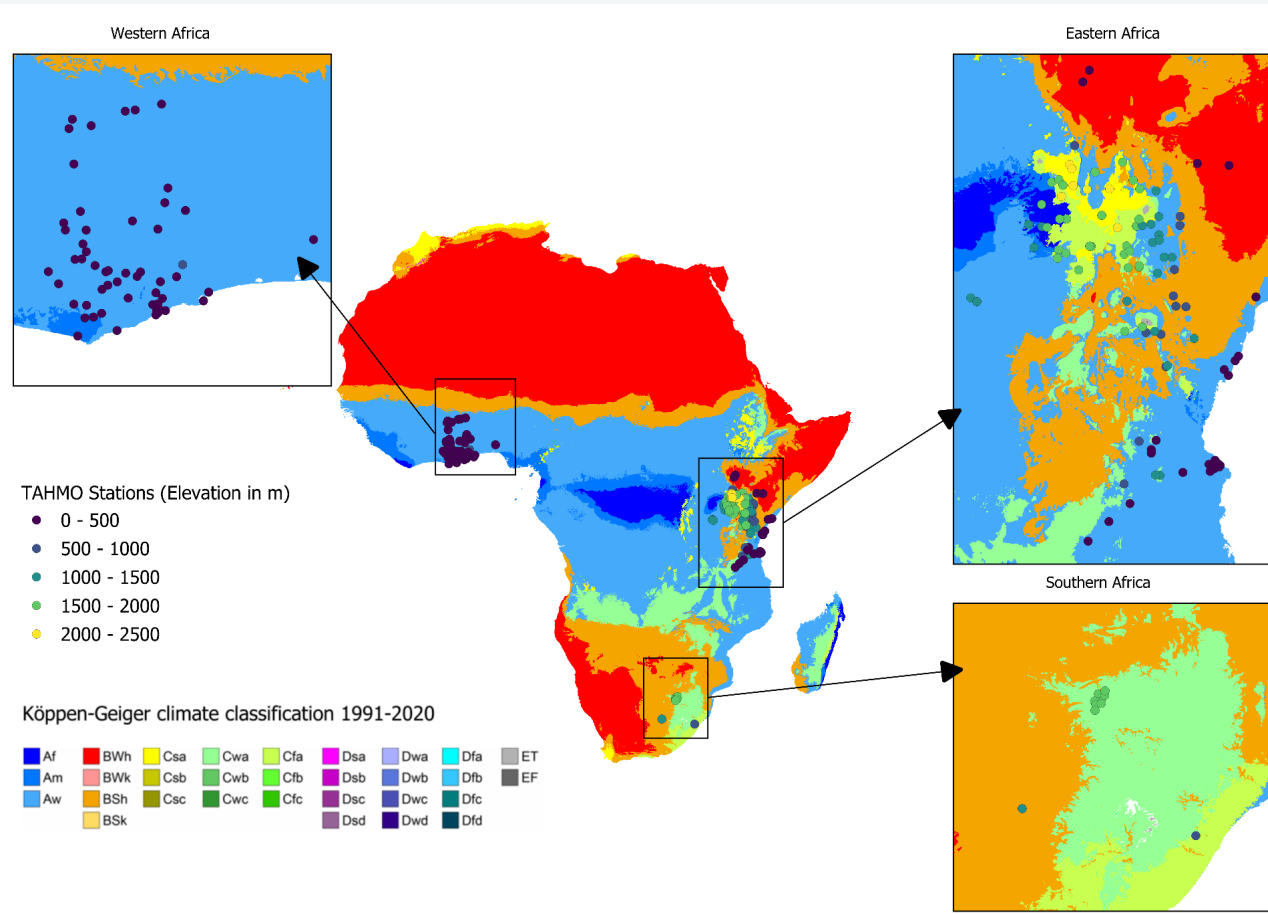
WaPOR RET data validation

Comparison different products

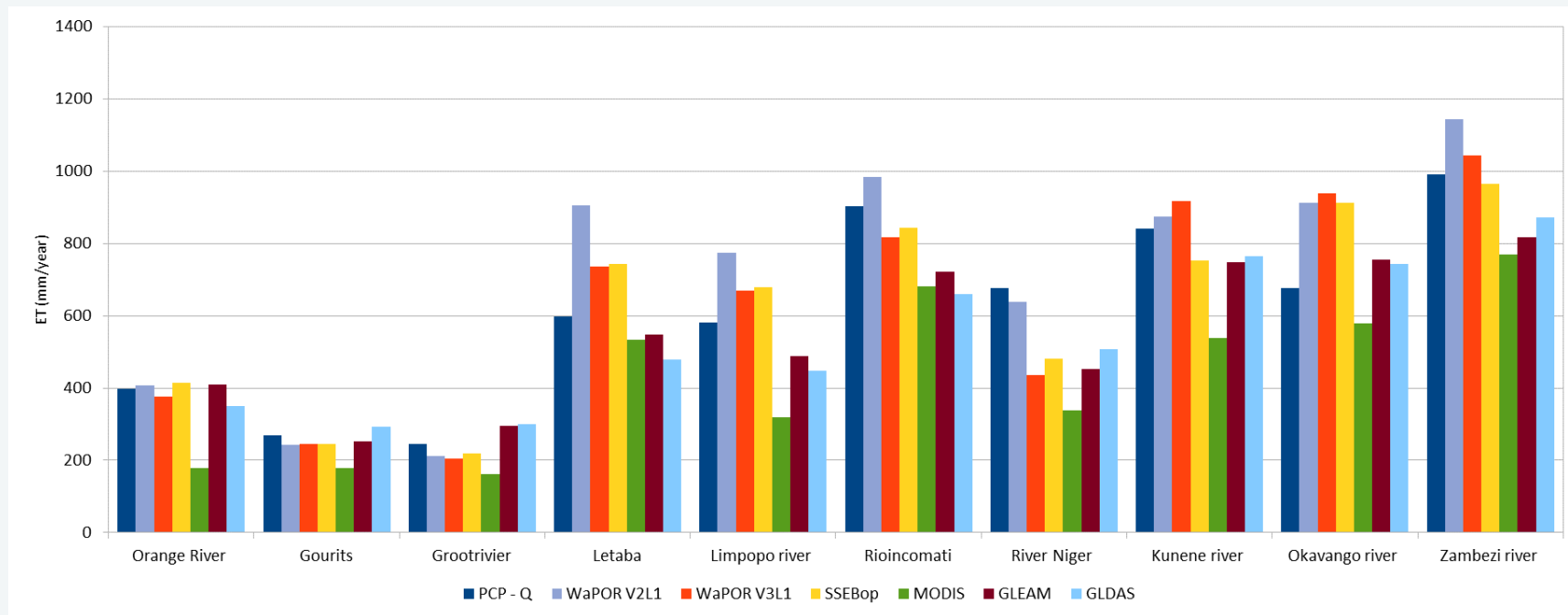
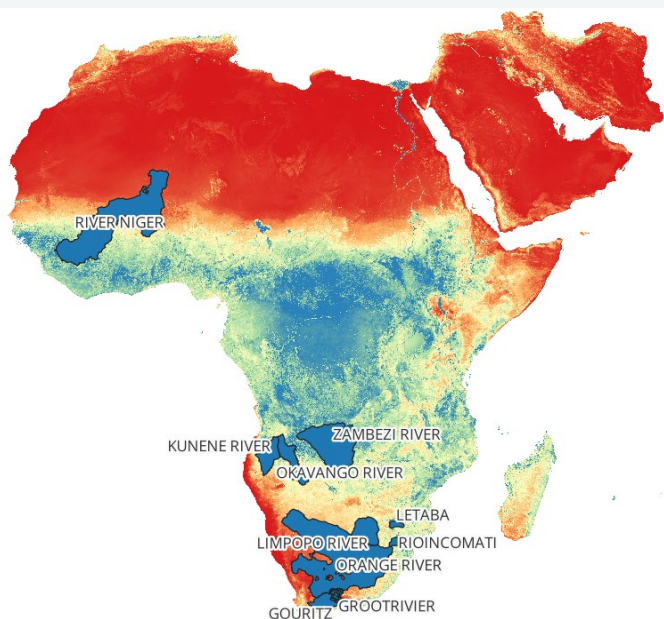


WaPOR RET data validation

Tahmo 165 climate stations

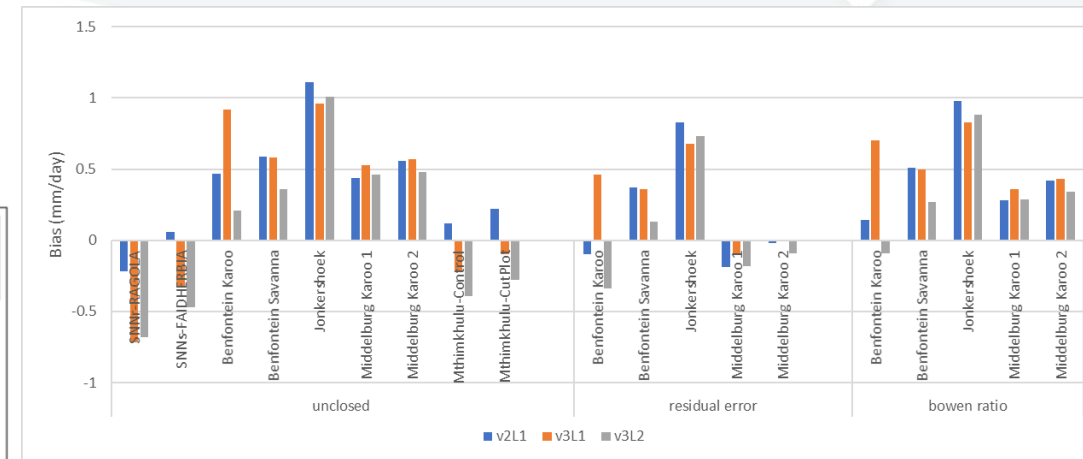
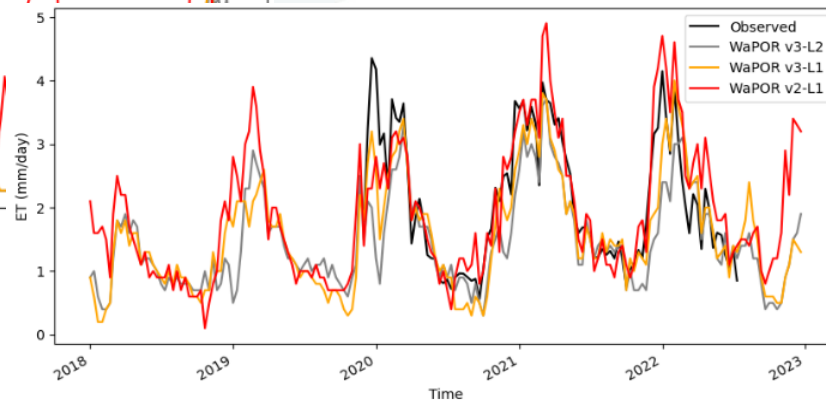
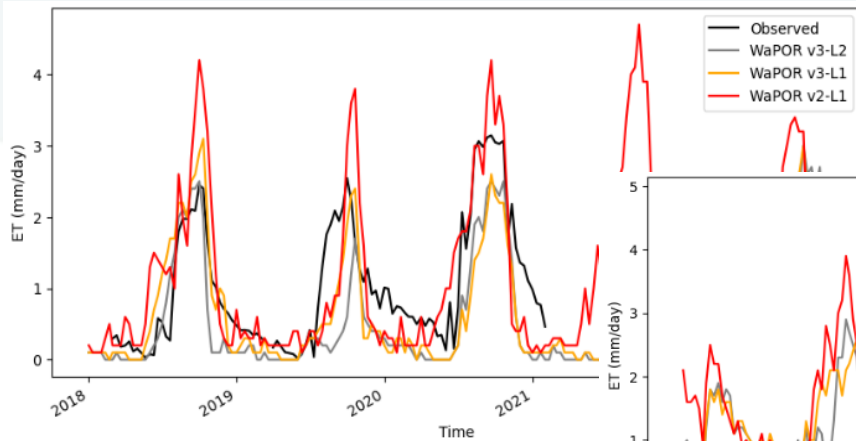
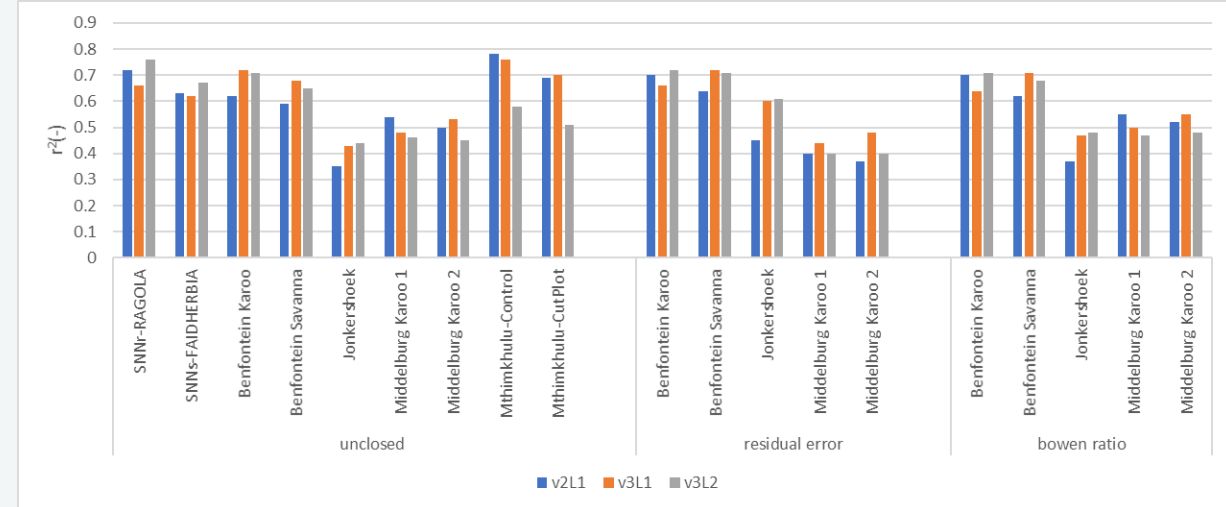
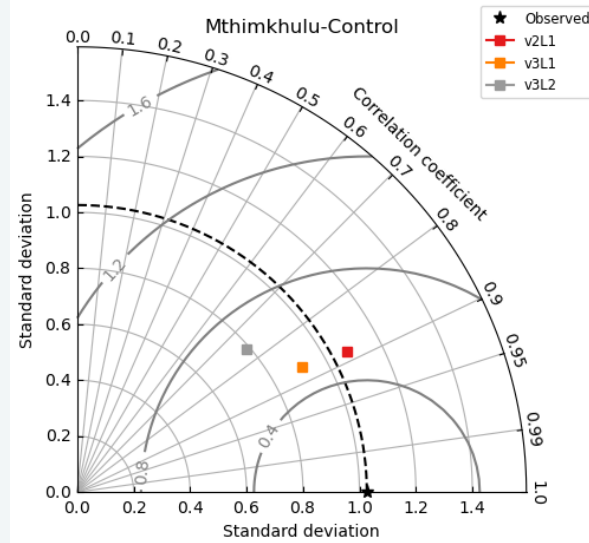
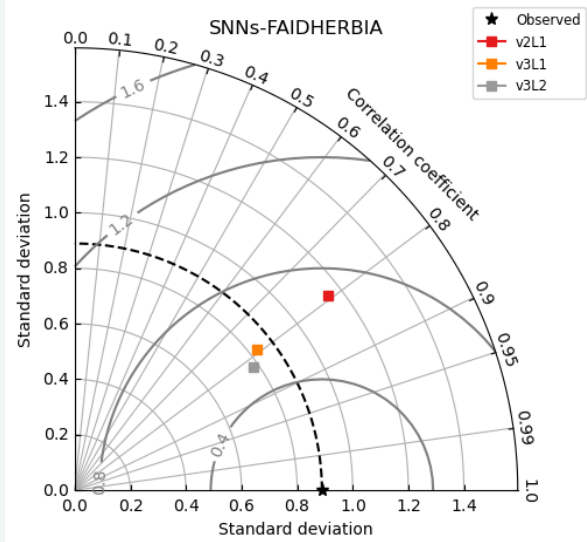


Water balance (AETI validation)



	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

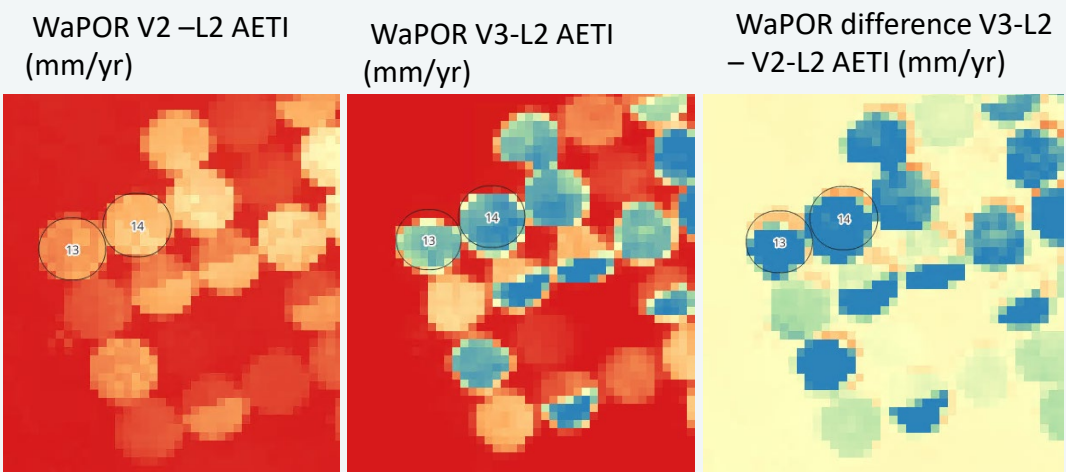
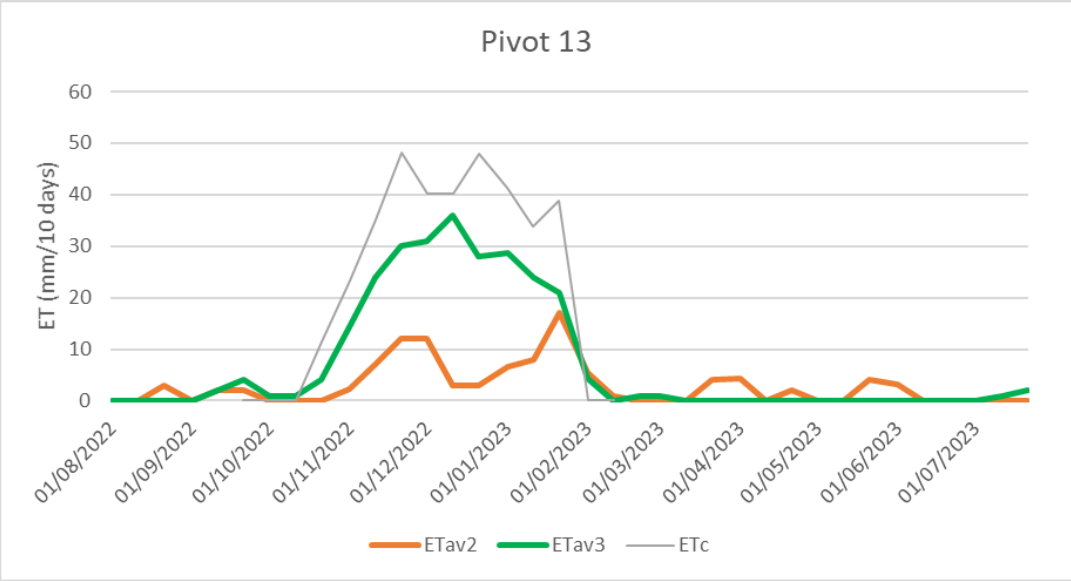
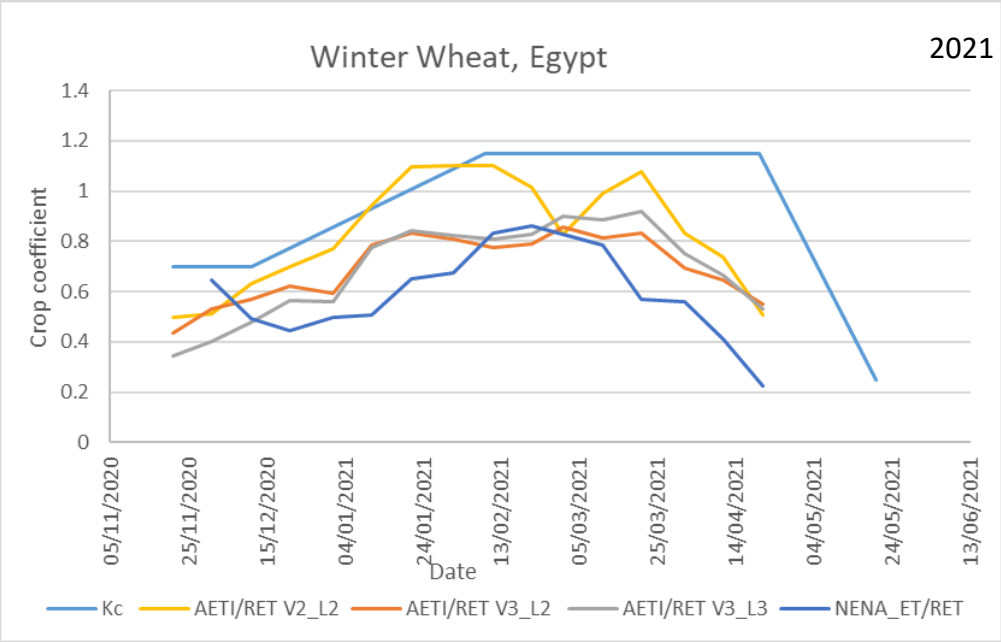
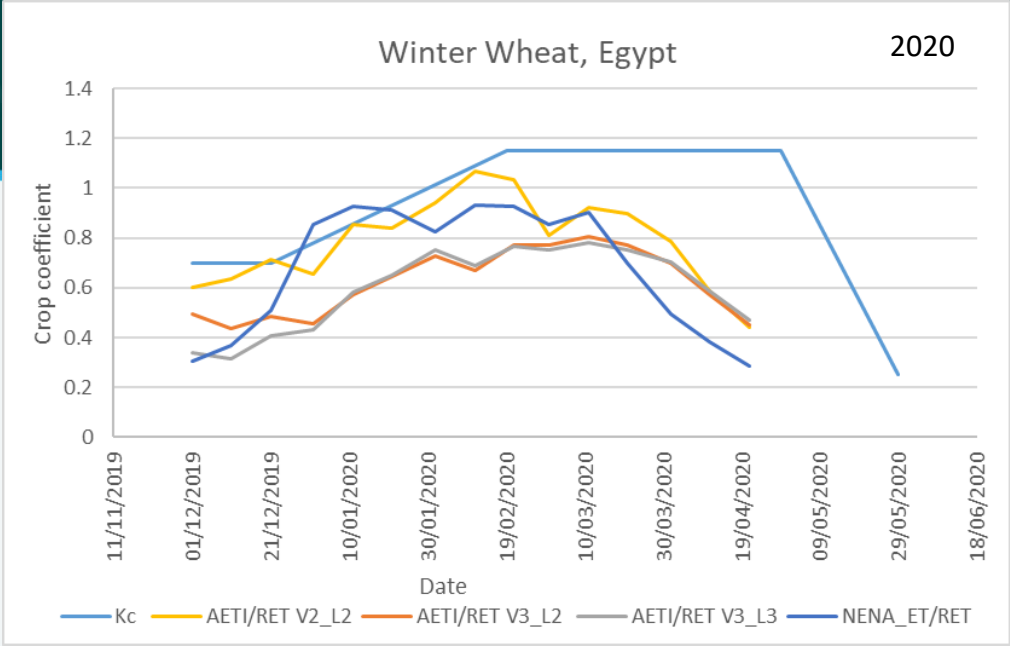


Figure 1 annual WaPOR AETI for selected centre pivots in El Oweinat in Egypt in mm/year for 2022



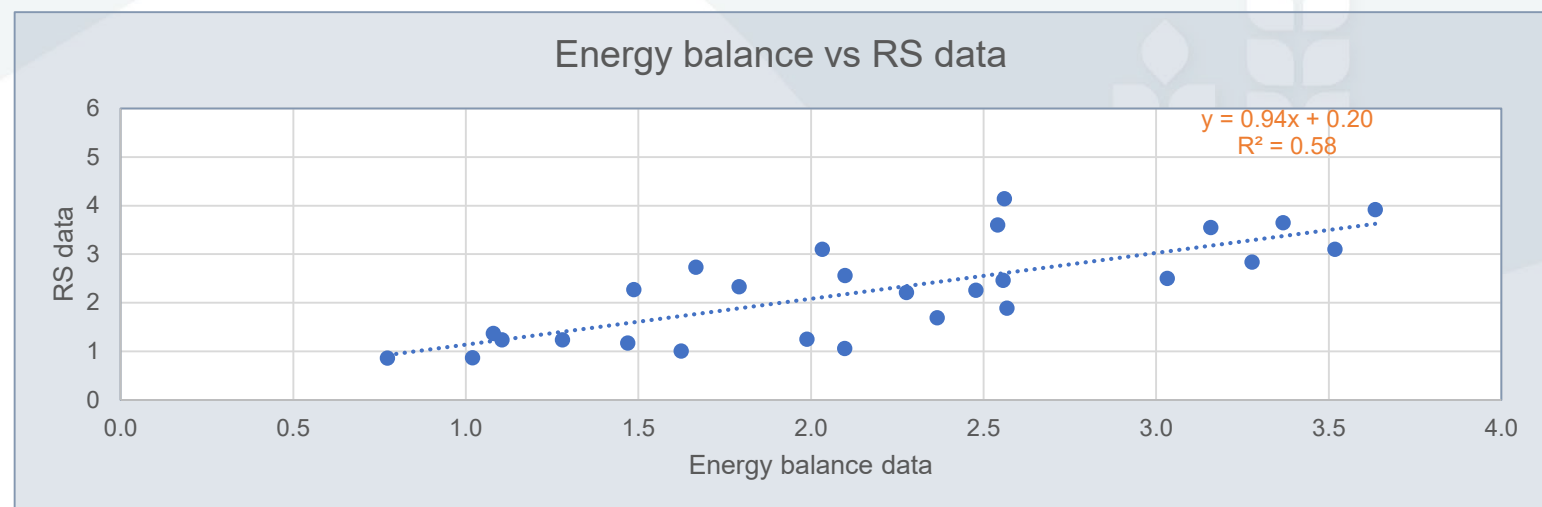
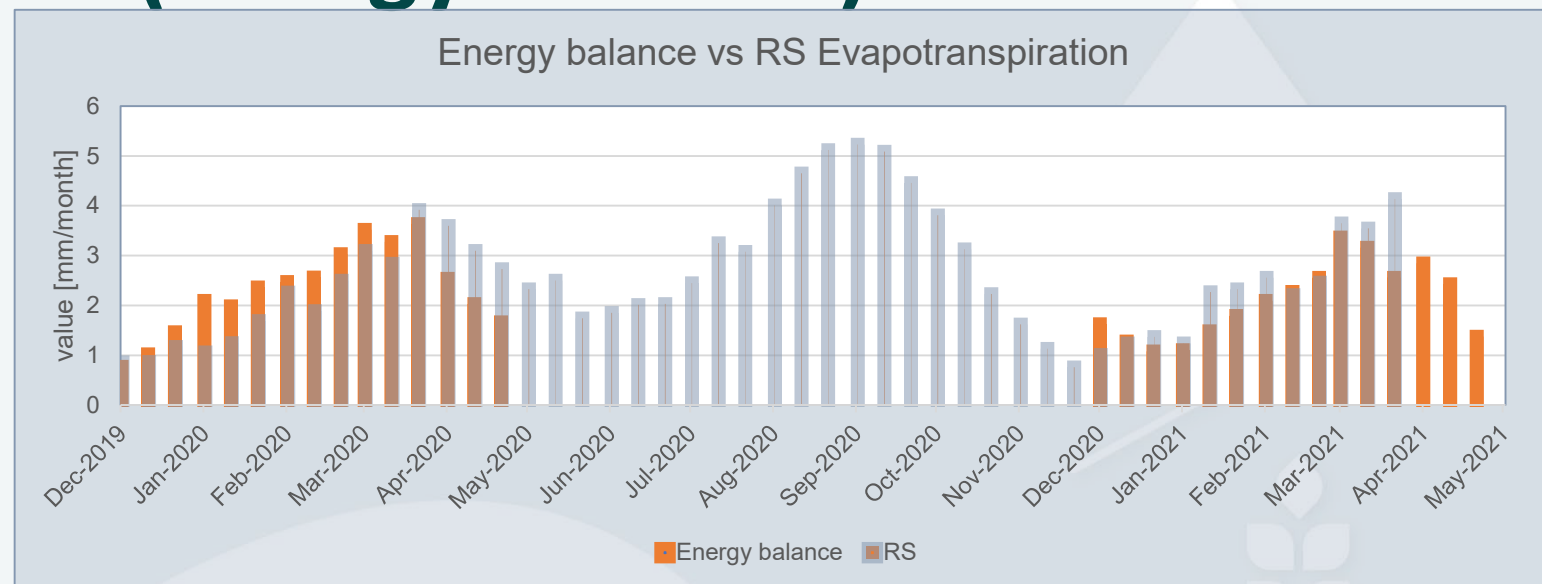
Centre pivots in Egypt



Crop coefficient during cropping stages (Nile Delta)

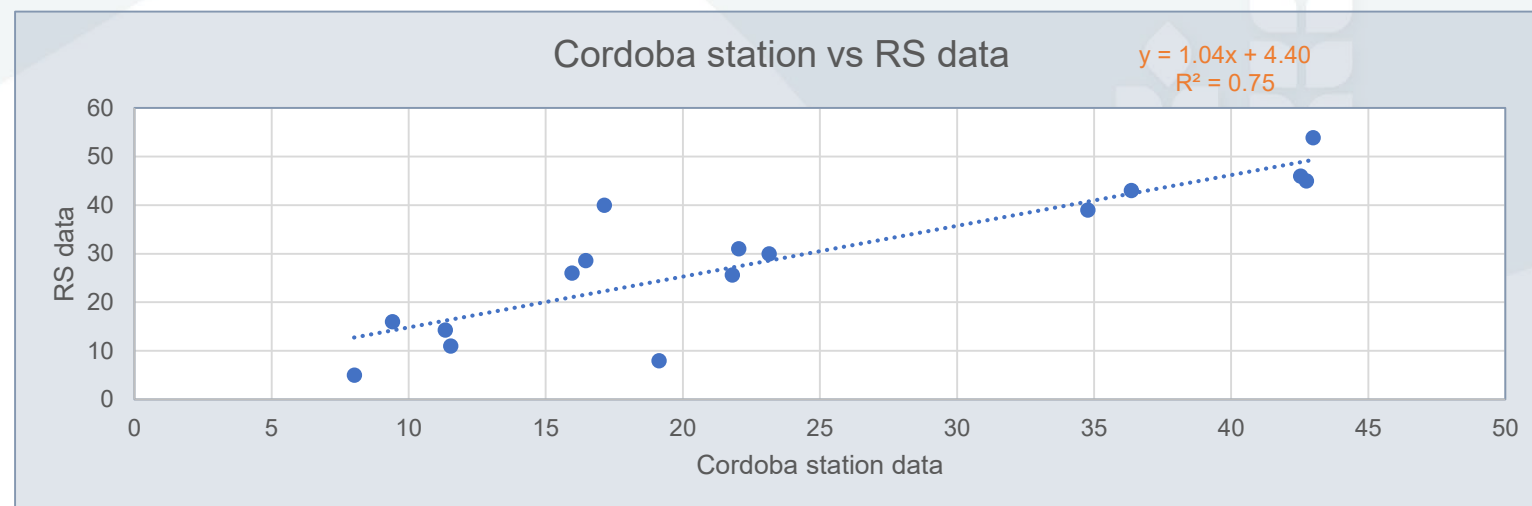
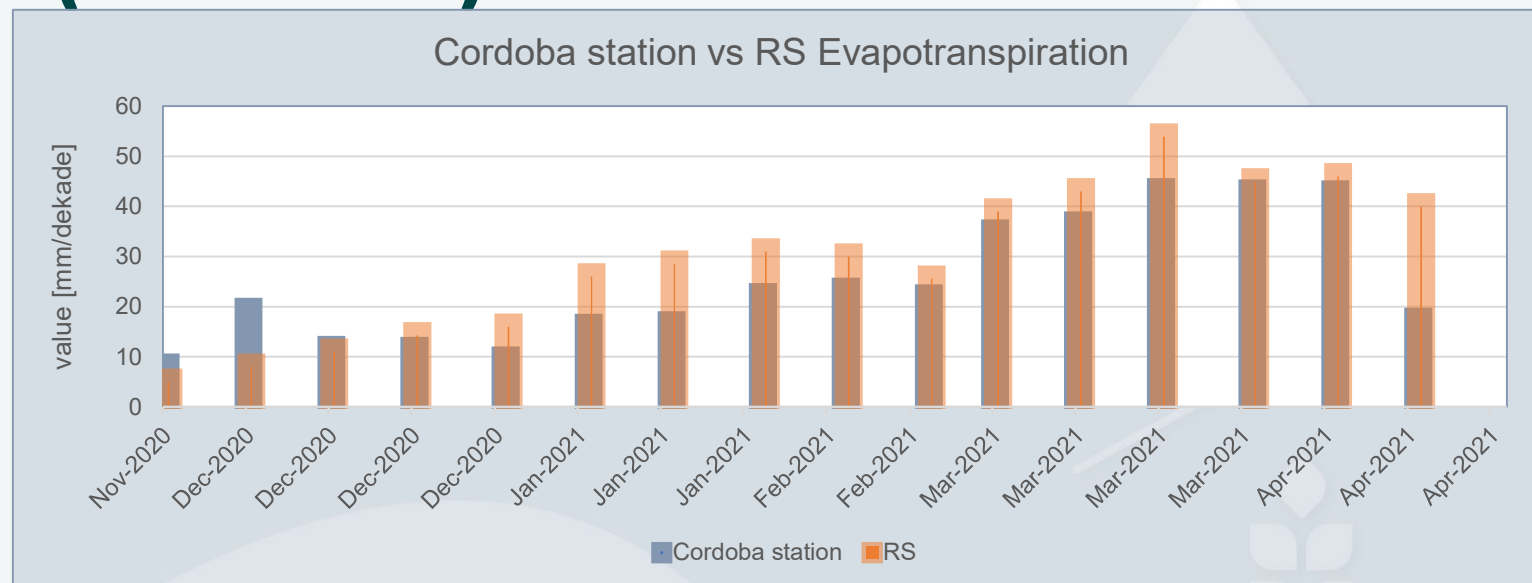
Validation Sakha station (energy balance)

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 Sids station (Cordoba)

Average	23.5
Number of data points	16
Evaluation metrics	
Pearson's correlation coefficient (CC)	0.87
Coefficient of determination (R2)	0.75
Nash-Sutcliffe Efficiency (NSE)	0.44
Kling-Gupta Efficiency (KGE)	0.67
Bias	5.44
PBIAS	23.1
Root mean square error (RMSE)	9
Mean Absolute error (MAE)	7.28



Validation data overview

WaPOR layer	In-situ data	Temporal resolution*	Auxiliary data	Data in Egypt
Reference ET	Weather station data (incl humidity, solar radiation, windspeed, temperature)	Daily or more frequent		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 more frequent	Field or section scale soil water balance, catchment water balance	Sakha, Sids, Minya stations (NENA-ET network)
E (open water)	evaporation pan	Daily or more frequent		E-pan
T	Eddy covariance (ET partition), sapflow	Daily or more frequent		#N/A
NPP	Eddy covariance	Daily or more frequent	Seasonal biomass production, yield (and crop type coefficients)	Field data collection
RSM	Soil moisture measurements	Daily or more frequent	Field or section scale soil water balance	Field data collection



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This course was produced as part of the
second phase of the WaPOR project



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