AGU 2019 Fall Meeting

Enhancing the Spatial Resolution of Diurnal LST from Geostationary Satellites

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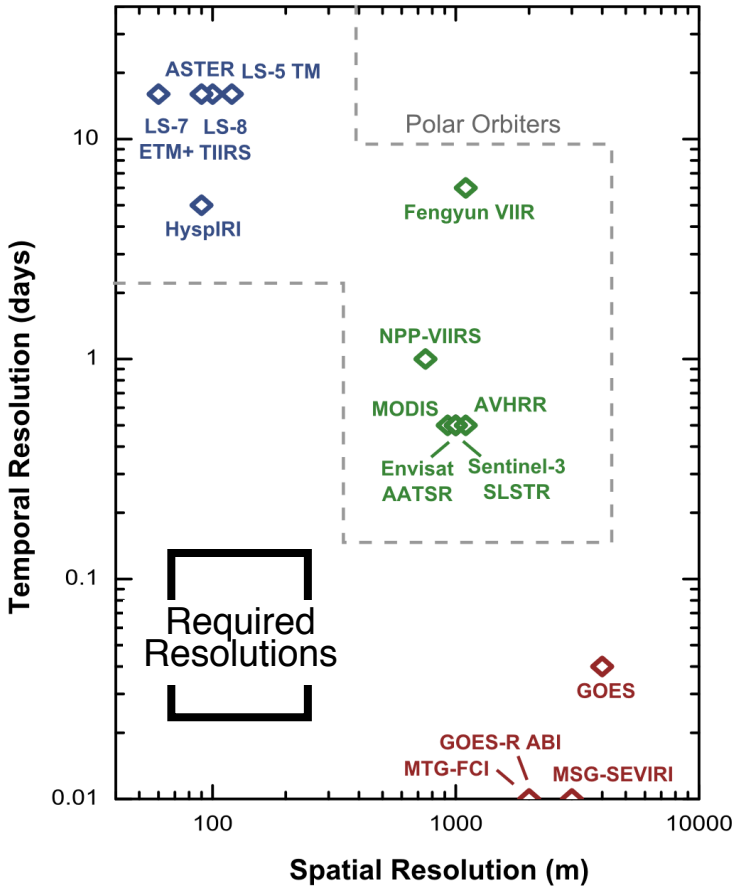
National Aeronautics and Space Administration, USA

Resolution Trade-off

Satellites **cannot** acquire data that combine high spatial and temporal resolution

We need a spatial resolution of approximately **100 m**

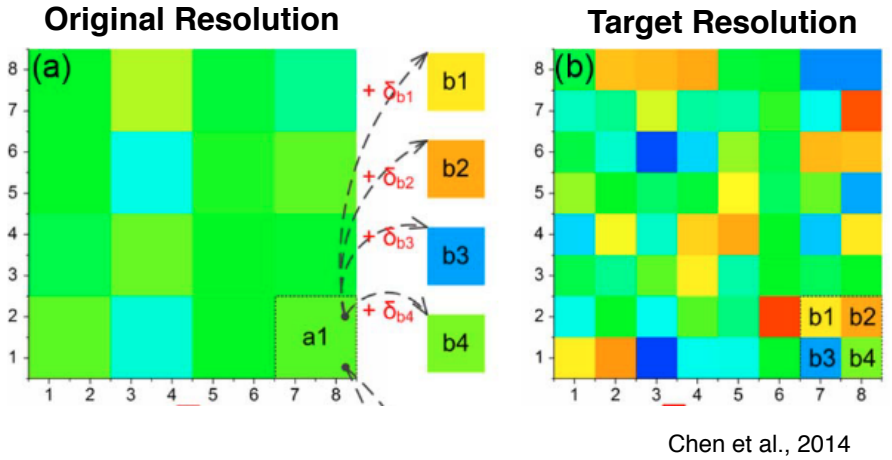
And a temporal resolution of approximately **1-2 h**



LST Downscaling

Statistical downscaling **disaggregates** coarse-scale LST to its components

It uses auxiliary data of **superior** spatial resolution are statistically correlated to the LST



Chen et al., 2014

Vegetation index

Albedo

climatology

Topography

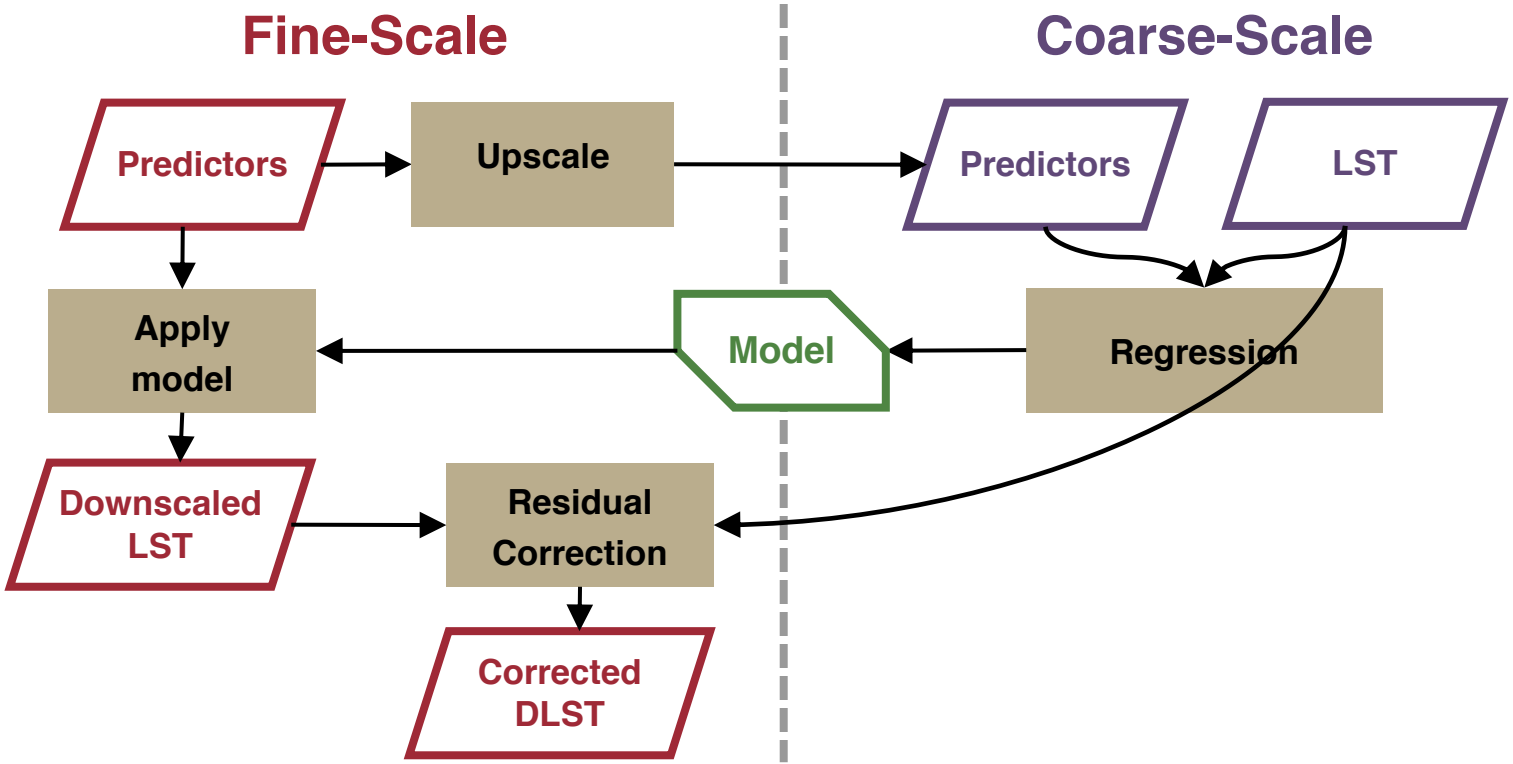
Emissivity

LST predictors

or

LST disaggregation Kernels

Typical Workflow

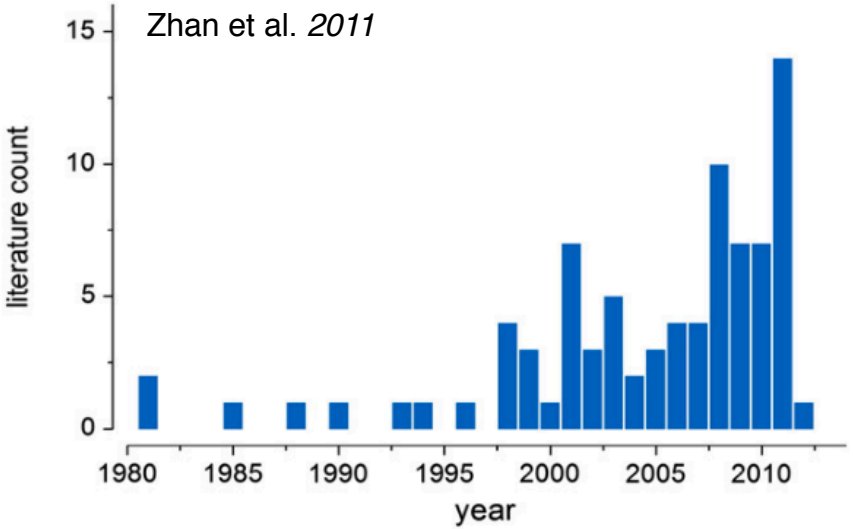


State-of-the-Art

One of the "*hottest*" topics in TIR RS.

4 km / 1 h ➡ 1 km / 1 h

1 km / daily ➡ 100 m / daily



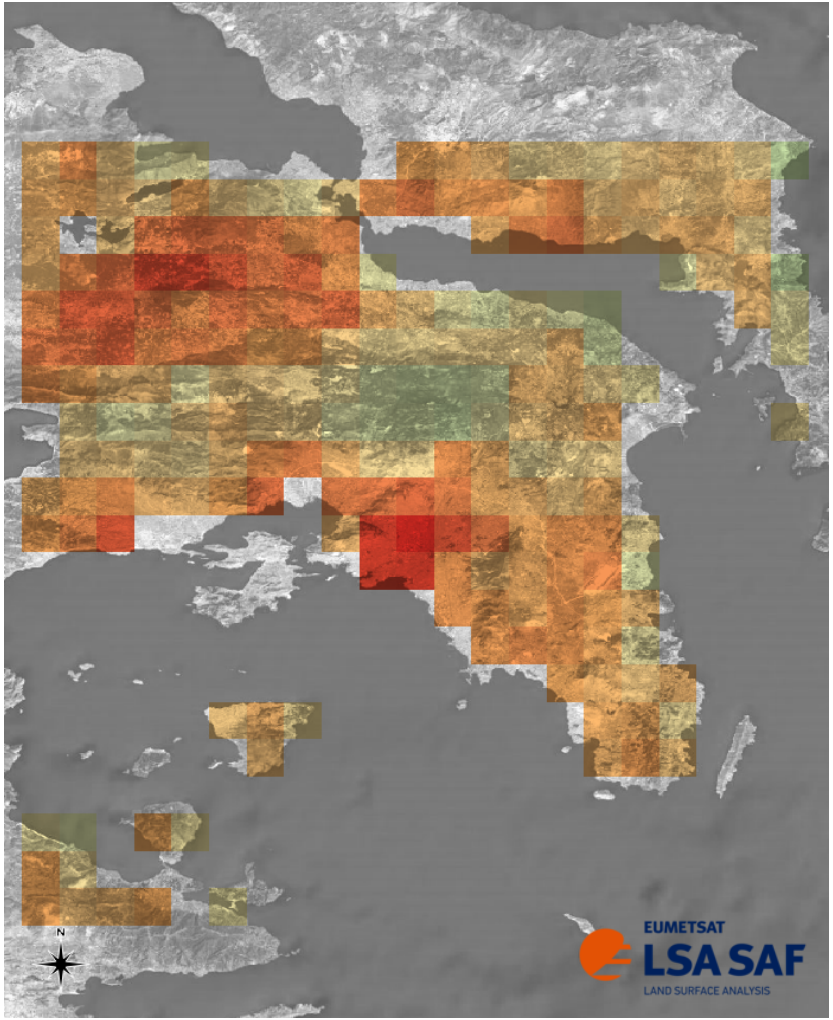
Study Case

Athens Greater Region, Greece

0.05 deg / 15 min SEVIRI LST

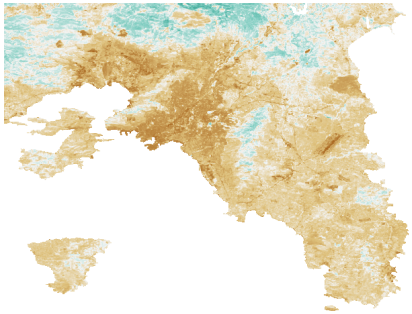
1-August-2018 to 30-September-2018

Target: 100 m / 15 min

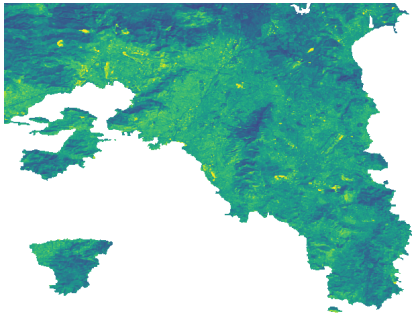


Predictors

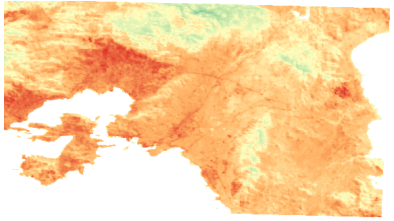
LS-8 NDVI



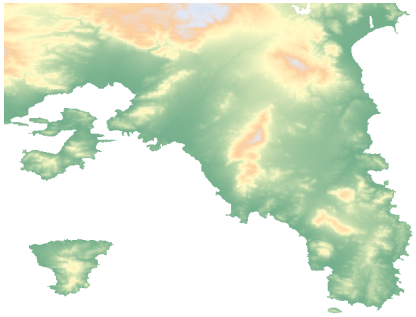
LS-8 Albedo



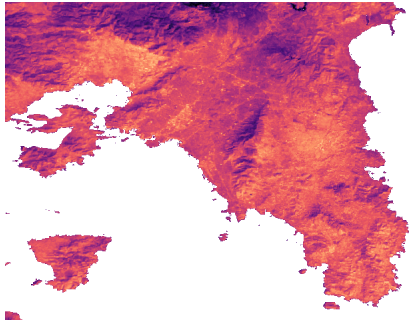
ECOSTRESS LST



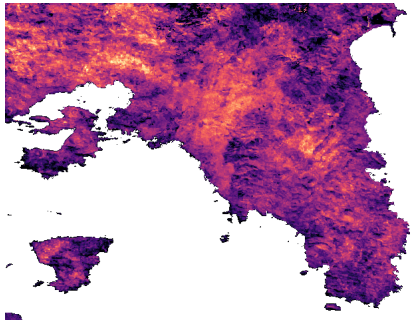
SRTM DEM



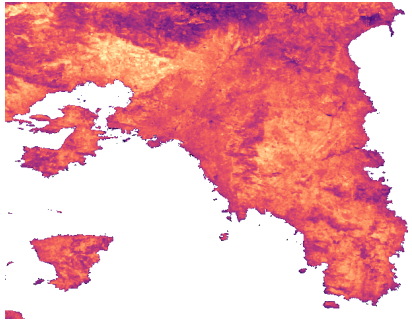
LS-8 MAST



LS-8 Theta

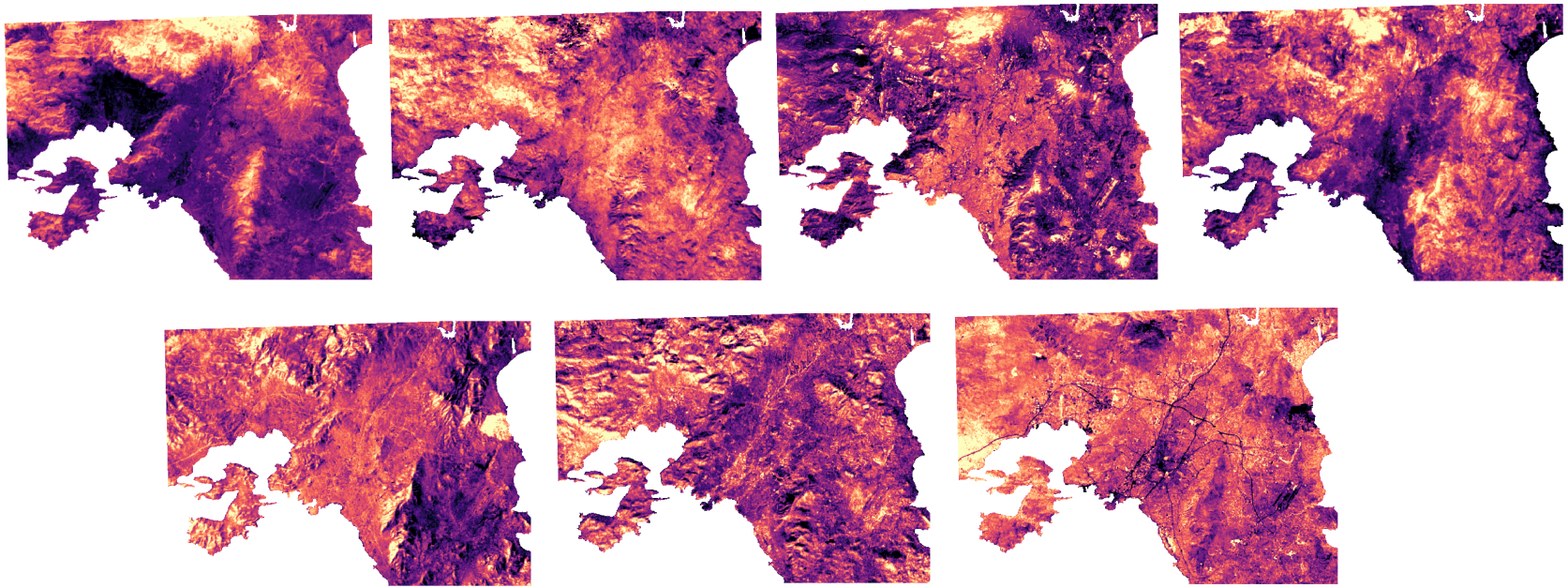


LS-8 YAST

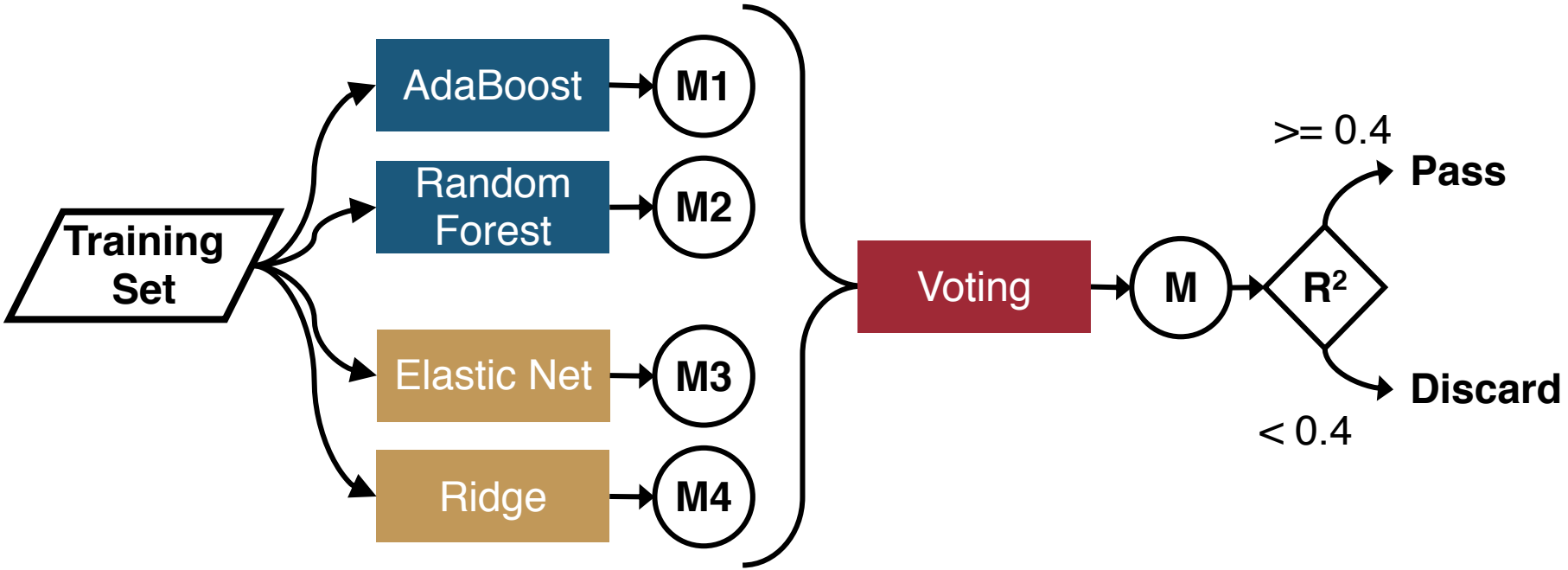


Preprocessing

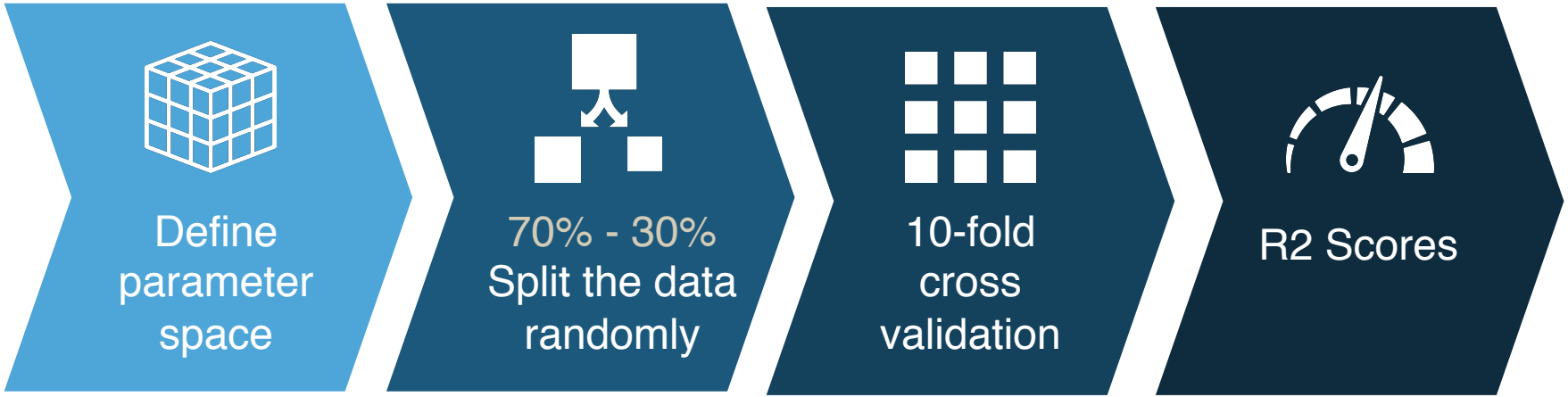
Resampling → **PCA transformation** → **Standardization**



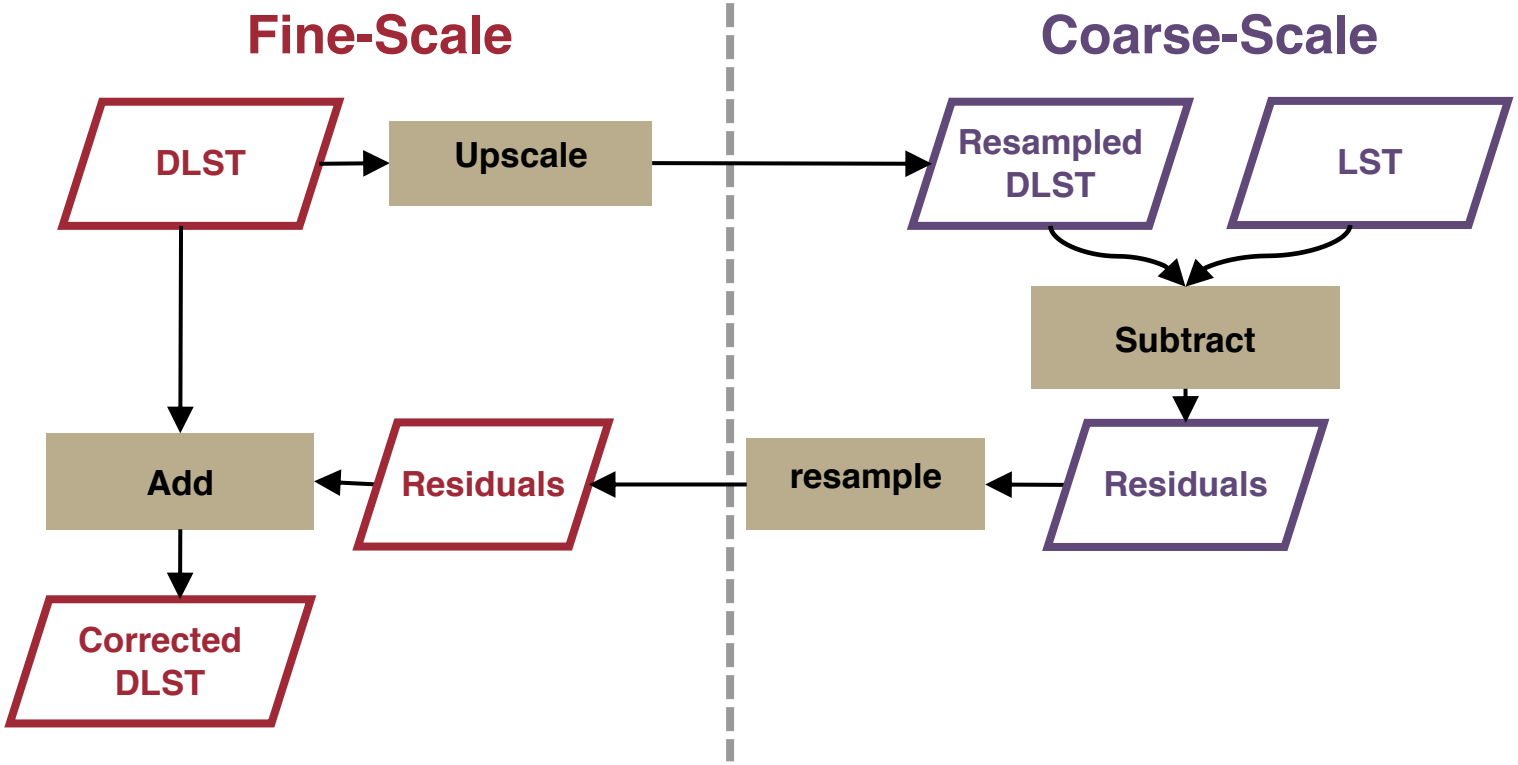
Regression


Training Set
AdaBoost
Random Forest
Elastic Net
Ridge
M1
M2
M3
M4
Voting
M
R²
>= 0.4
Pass
< 0.4
Discard

Tuning the hyper-parameters



Residual Correction



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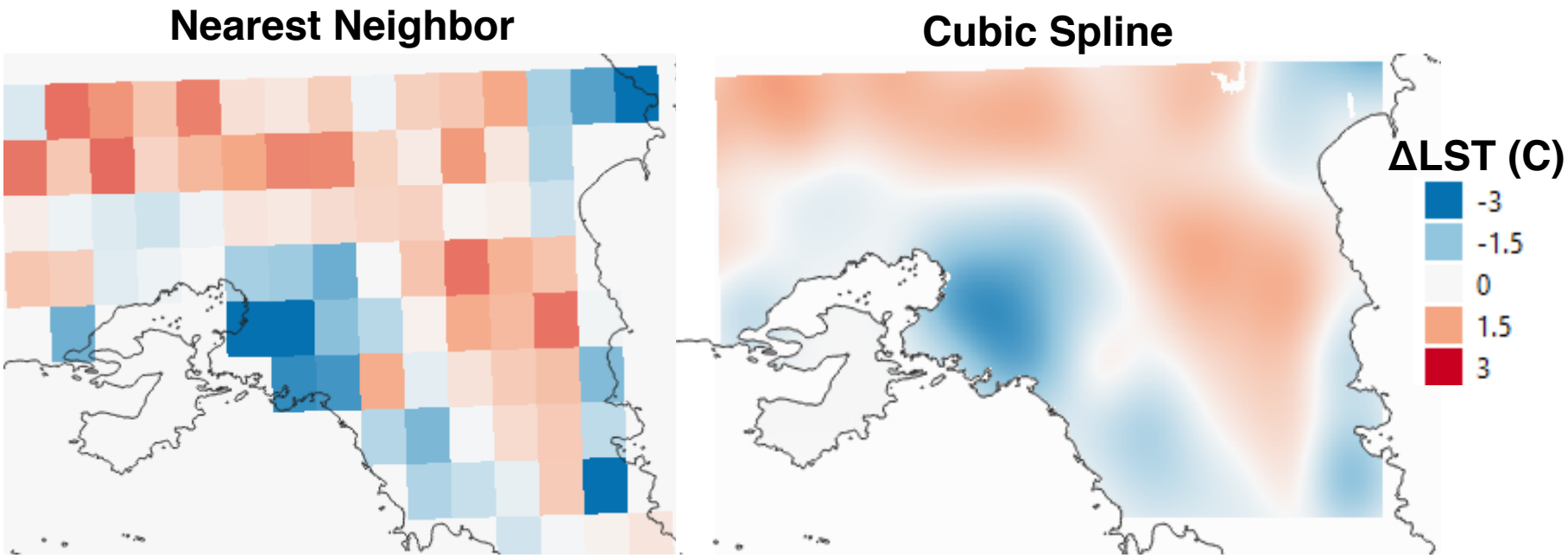
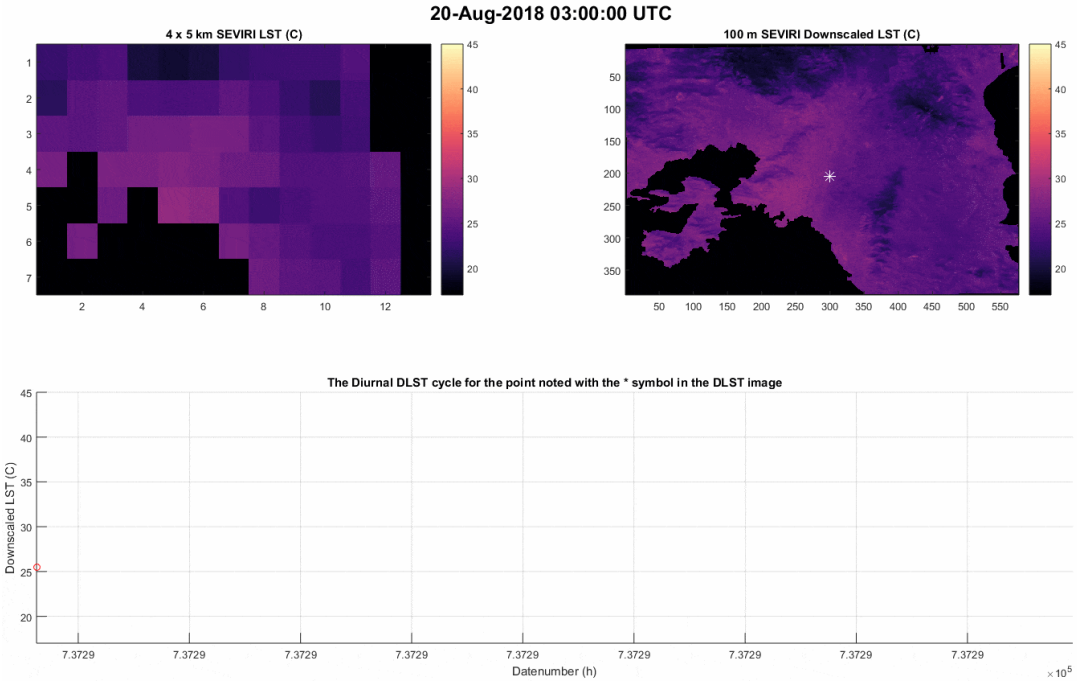
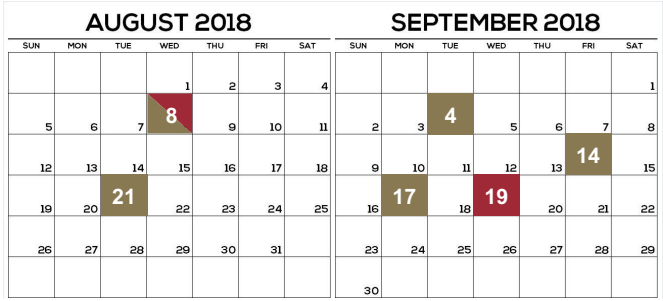
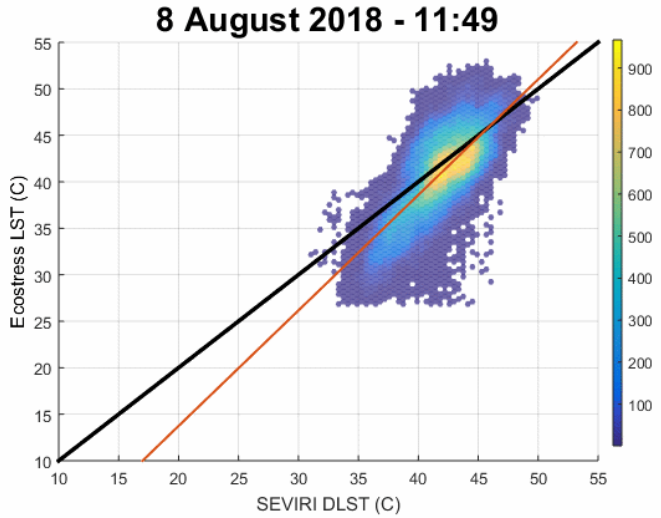


Results & Evaluation



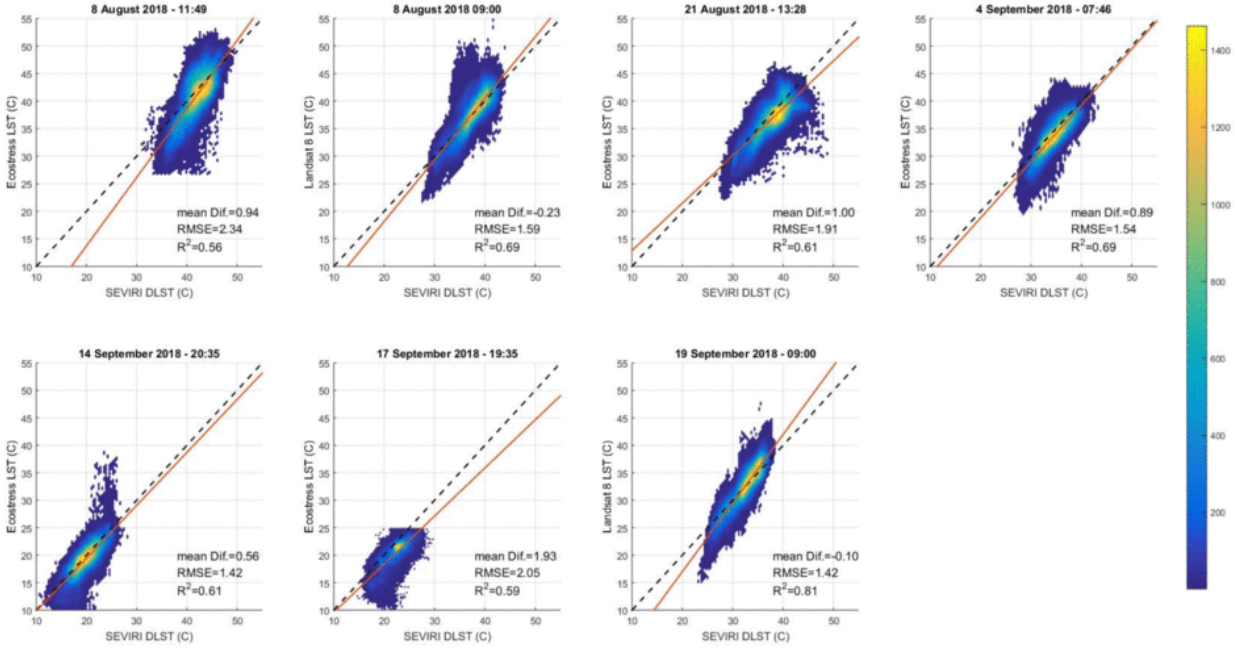


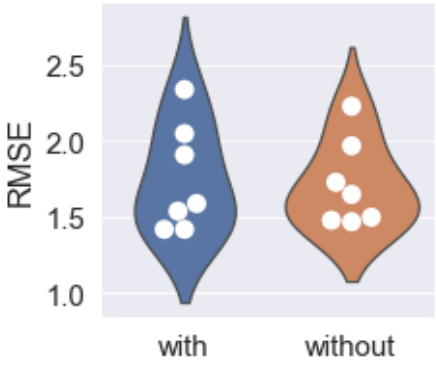
RMSE = 1.8°C ± 0.4°C R2 = 0.65 ± 0.08

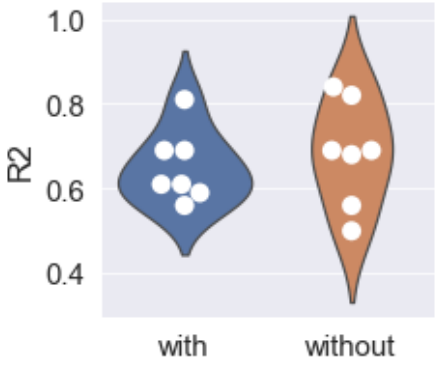


Residual Correction

With Residual Correction







Concluding Remarks

We need predictors that can describe the synoptic weather conditions.

We need better predictors for nighttime data.

We need a more sophisticated residual correction method.

You can get the downscaling code from github **@pansism**

Thank you!

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GA: 857125