GENERATION OF HIGH SPATIOTEMPORAL LAND SURFACE TEMPERATURE TIME SERIES

Enhancing the Spatial Resolution of Geostationary LST Data

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KEYWORDS
- TIR Remote Sensing
- Thermal Sharpening
- Geostationary LST
- Diurnal LST Data

INTRODUCTION

- **LST** is an important parameter of Land Surface Processes and a key input to many environmental applications.

- Presently, LST data are retrieved from **Satellite Thermal Remote Sensing**.

- Due to the **anti-correlation** between the spatial and temporal resolution, TIR satellite sensors cannot offer LST data that **match** the characteristic scale of the LST diurnal cycle.

- The **statistical downscaling** of geostationary TIR data is an effective technic to generate LST datasets that **combine** high spatial and temporal resolution.

High Spatiotemporal LST data are valuable for the study of the Hydrological Cycle and the Urban Thermal Environment.

SATELLITE DATA

In my research I use LST data from MSG-SEVIRI. MSG-SEVIRI is a geostationary weather satellite operated by EUMETSAT.

It acquires data in 12 spectral bands every **5-15 min** (5 min in RSS mode) with a spatial resolution of **3-5 km**.

PUBLICATIONS

Sismanidis, P.; Keramitsoglou, I.; Kiranoudis, C. T.; Bechtel, B. Assessing the Capability of a Downscaled Urban Land Surface Temperature Time Series to Reproduce the Spatiotemporal Features of the Original Data. Remote Sens. 2016, 8 (4), 274.

Sismanidis, P.; Keramitsoglou, I.; Kiranoudis, C. T. Evaluating the Operational Retrieval and Downscaling of Urban Land Surface Temperatures. IEEE Geosci. Remote Sens. Lett. 2015, 12 (6), 1312–1316.
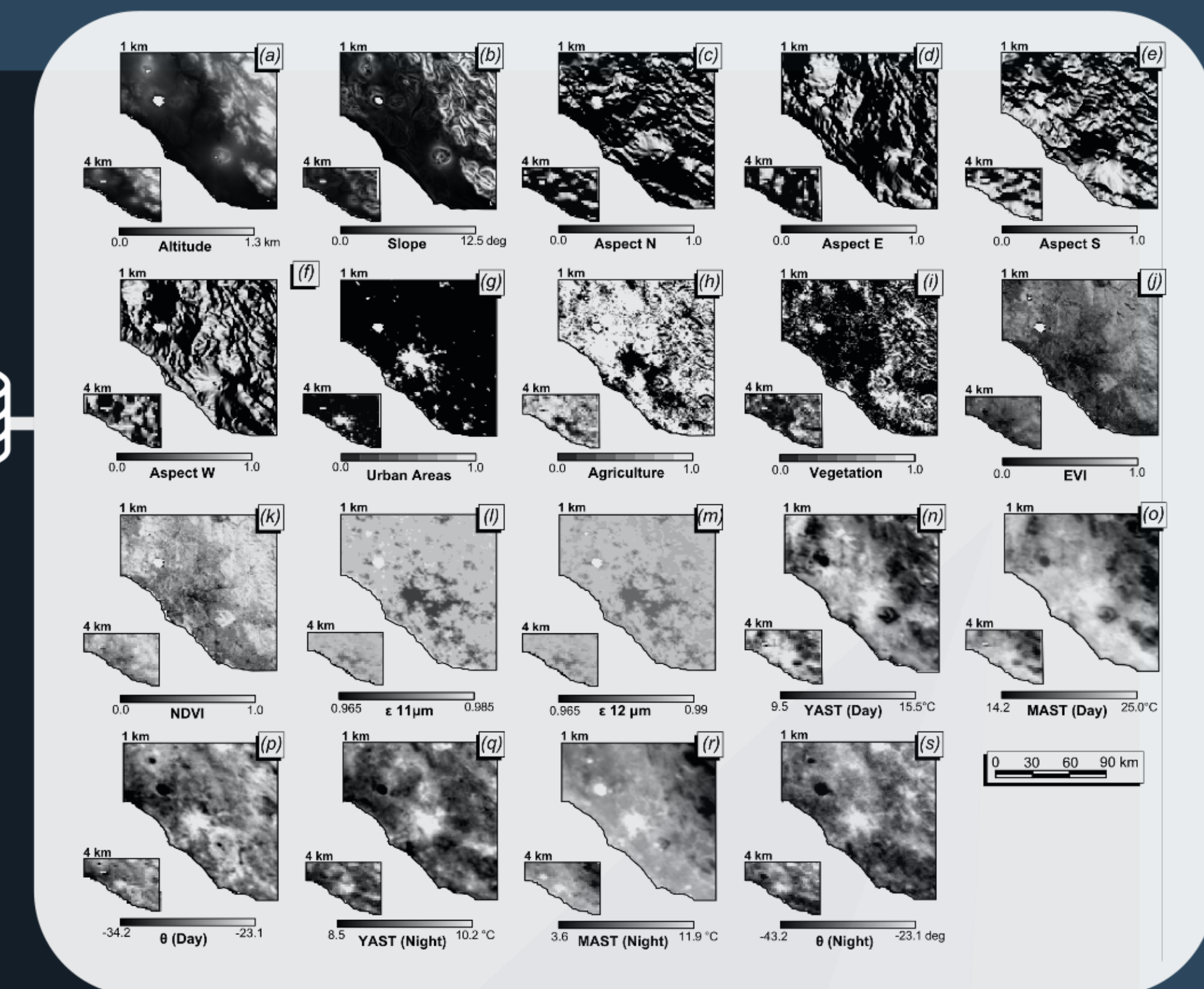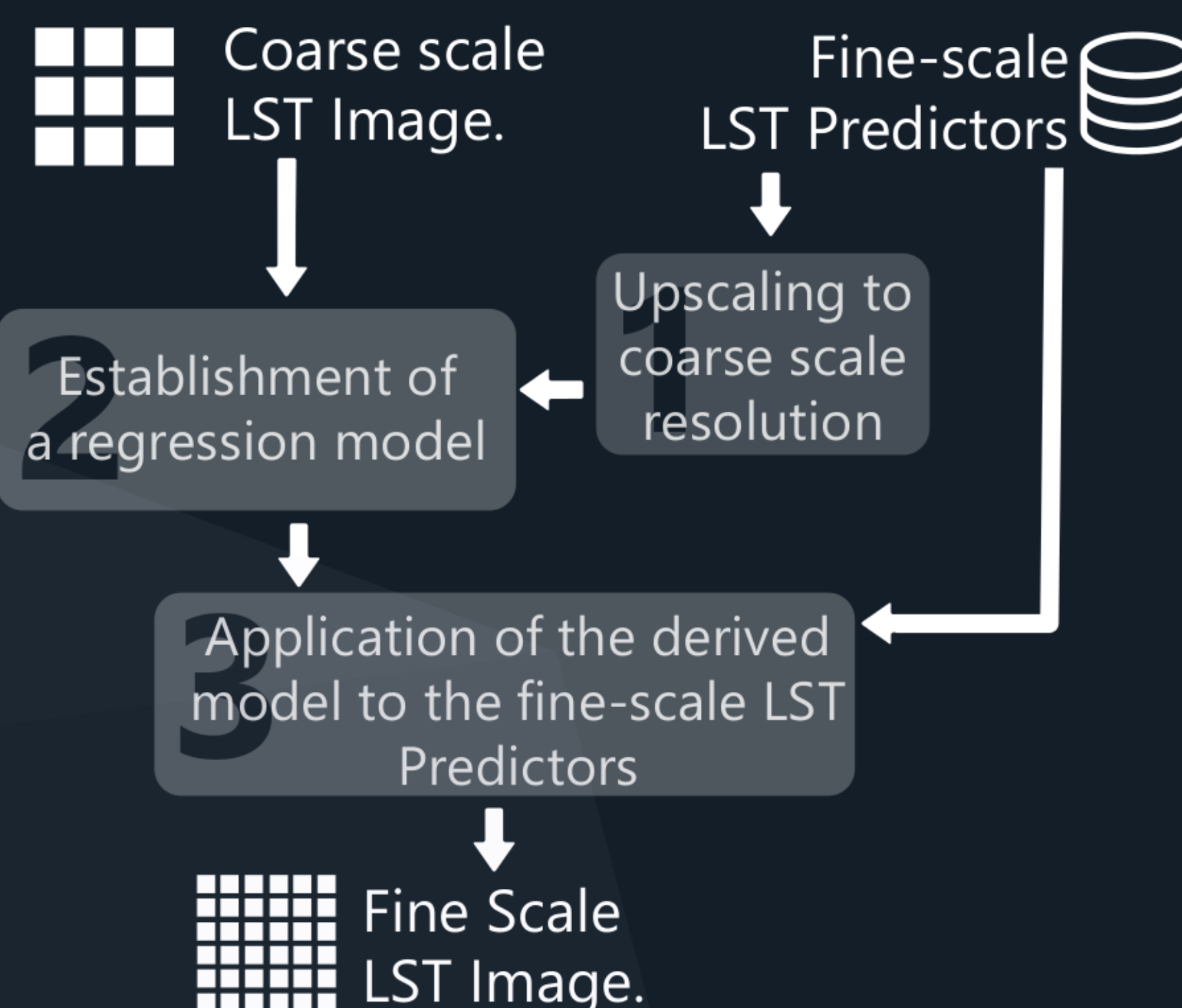
ACKNOWLEDGMENT

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METHODOLOGY

BASIC STEPS:

Coarse scale LST Image. → Establishment of a regression model ← Upscaling to coarse scale resolution ← Fine-scale LST Predictors

Establishment of a regression model → Application of the derived model to the fine-scale LST Predictors ← (Fine-scale LST Predictors)

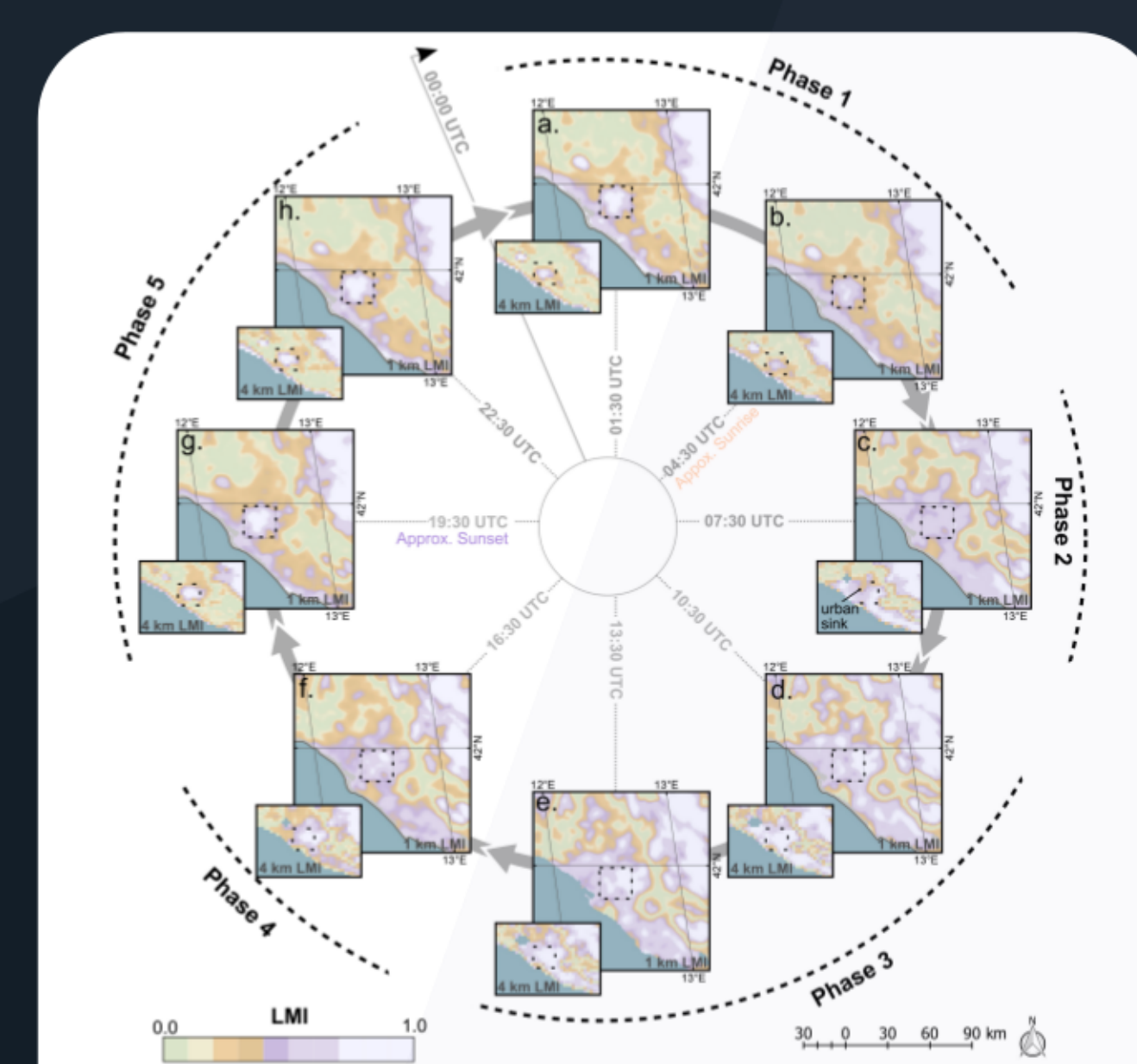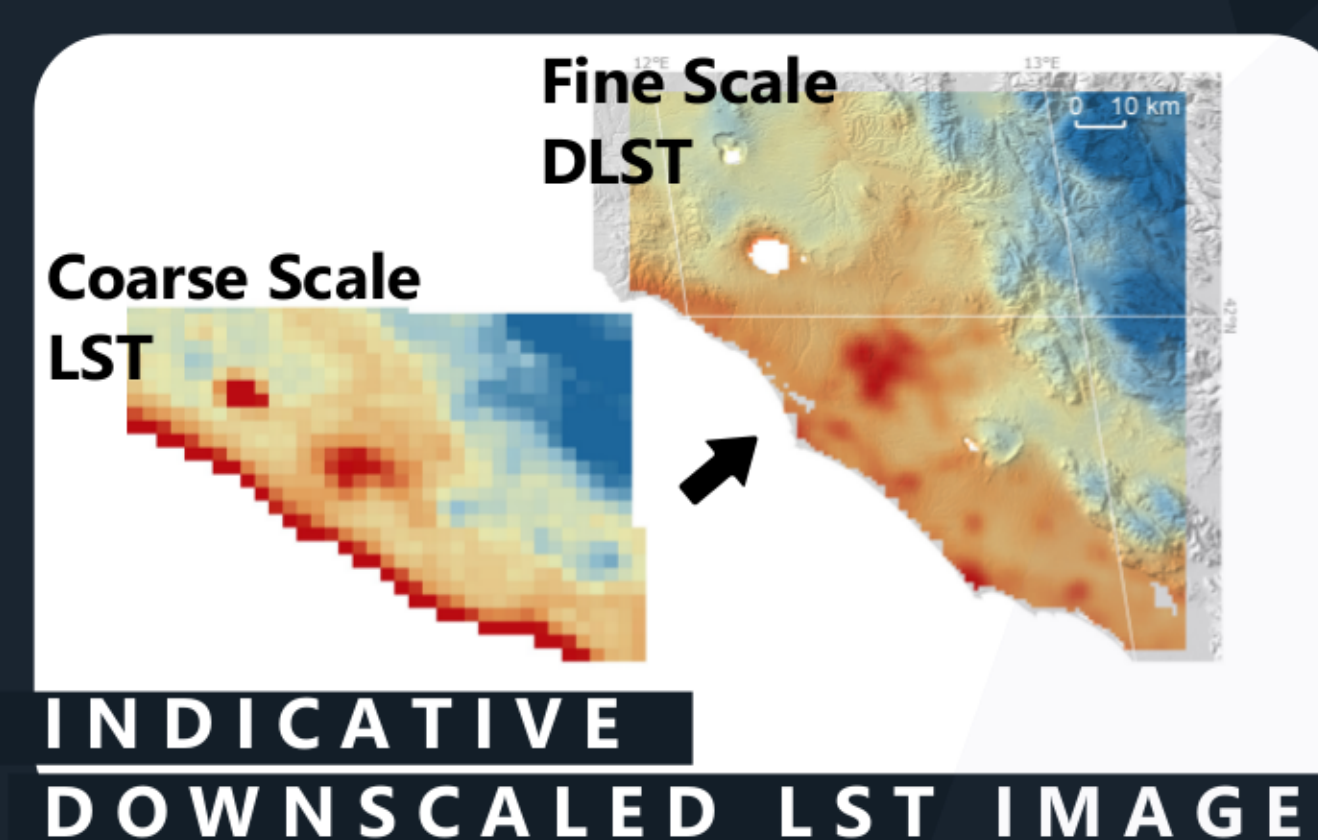Application of the derived model to the fine-scale LST Predictors → Fine Scale LST Image.

The **LST Predictors** are spatially distributed auxiliary data that are statistically correlated to LST and thus can explaining its **spatial variation**.
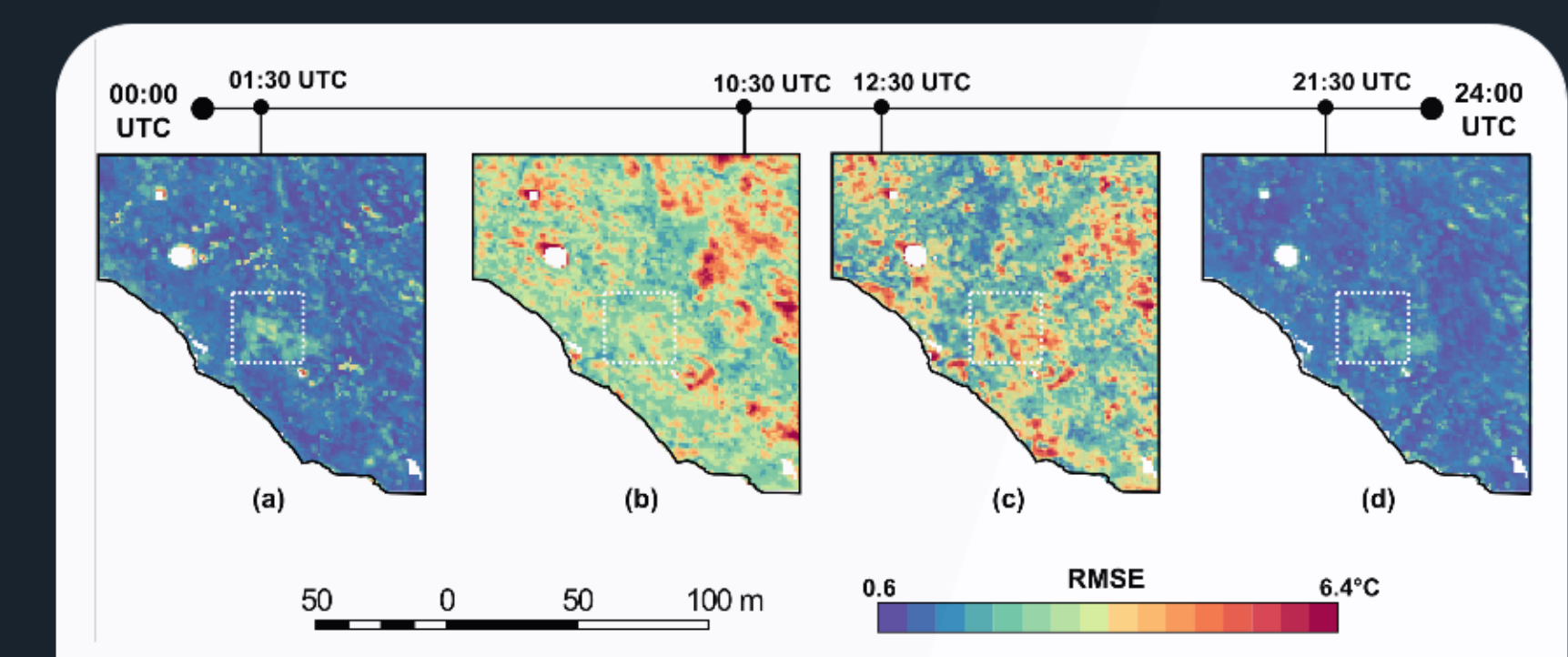
RESULTS & DISCUSSION

In my research I have downscaled a **three month long** time series of MSG3-SEVIRI LST data using a set of 17 LST predictors and a SVM as a regression tool and then assessed the **accuracy**, **correct pattern-formation** and the **spatiotemporal inter-relationships** of the downscaled LST data.


INDICATIVE DOWNSCALED LST IMAGE

SPATIAL RMSE [Comparison with MODIS Data]

- The RMSE was higher for daytime data.
- The spatial distribution of RMSE differs between night and day.
- Rural areas exhibit the lowest (daytime and nighttime) RMSE.

DIURNAL EVOLUTION OF LST PATTERNS

- The DLST data were able to adequately emulate the diurnal evolution of the LST spatial patterns.
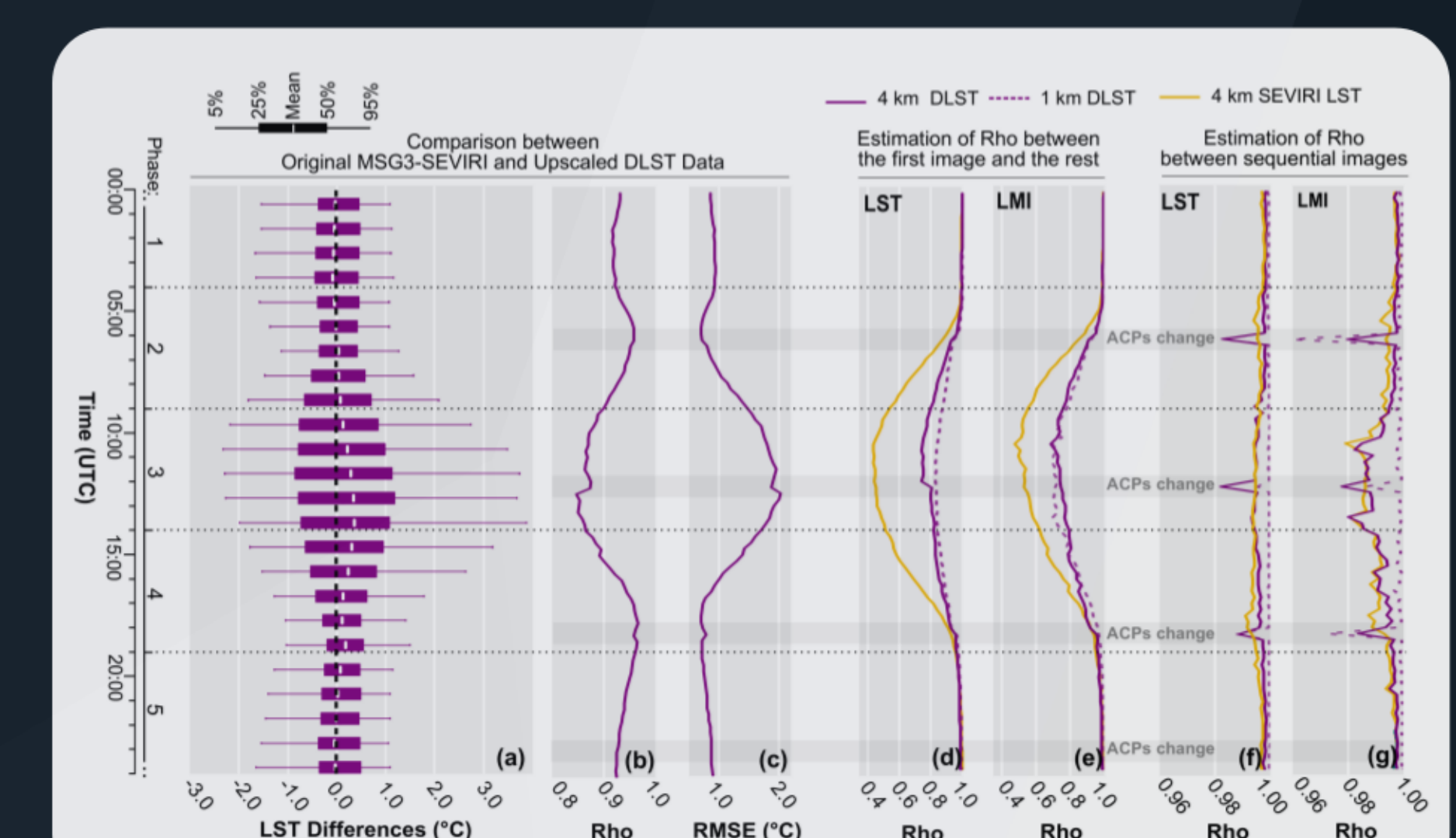
ACCURACY & AUTOCORRELATION

- The downscaling process preserves the radiometry of the original data.
- The DLST data exhibit an increased similarity in respect to the original data that make the diurnal changes less pronounced.

CONCLUSIONS

- The downscaling of frequently-acquired geostationary LSD data has the potential to compensate the lack of high spatiotemporal LST data.

- The downscaling of urban LST is more challenging than rural LST.

- A successful downscaling of LST time series should result in a smooth diurnal evolution of DLST values and patterns and emulate the short-term and seasonal features of the coarse-scale LST.