Atlas AI

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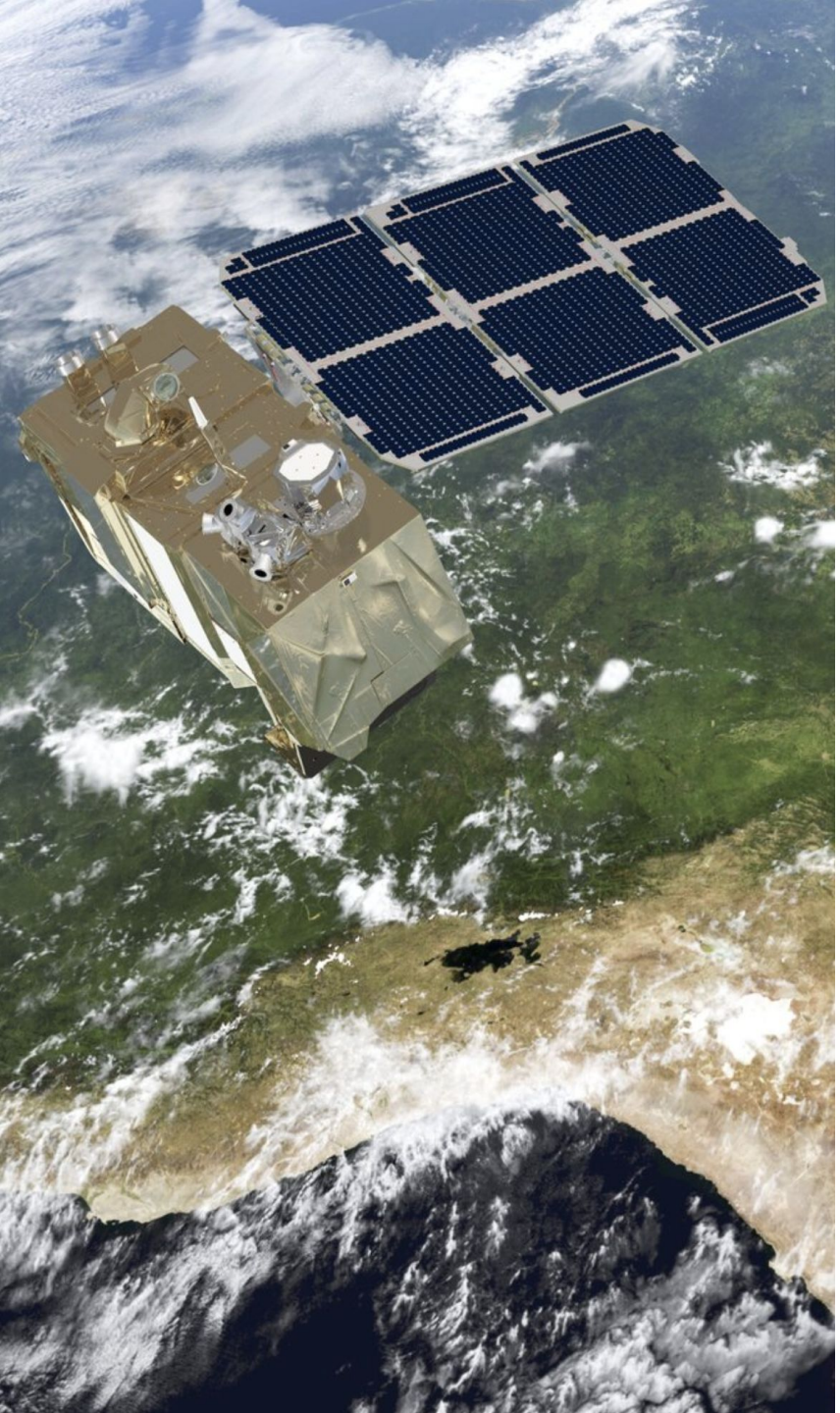
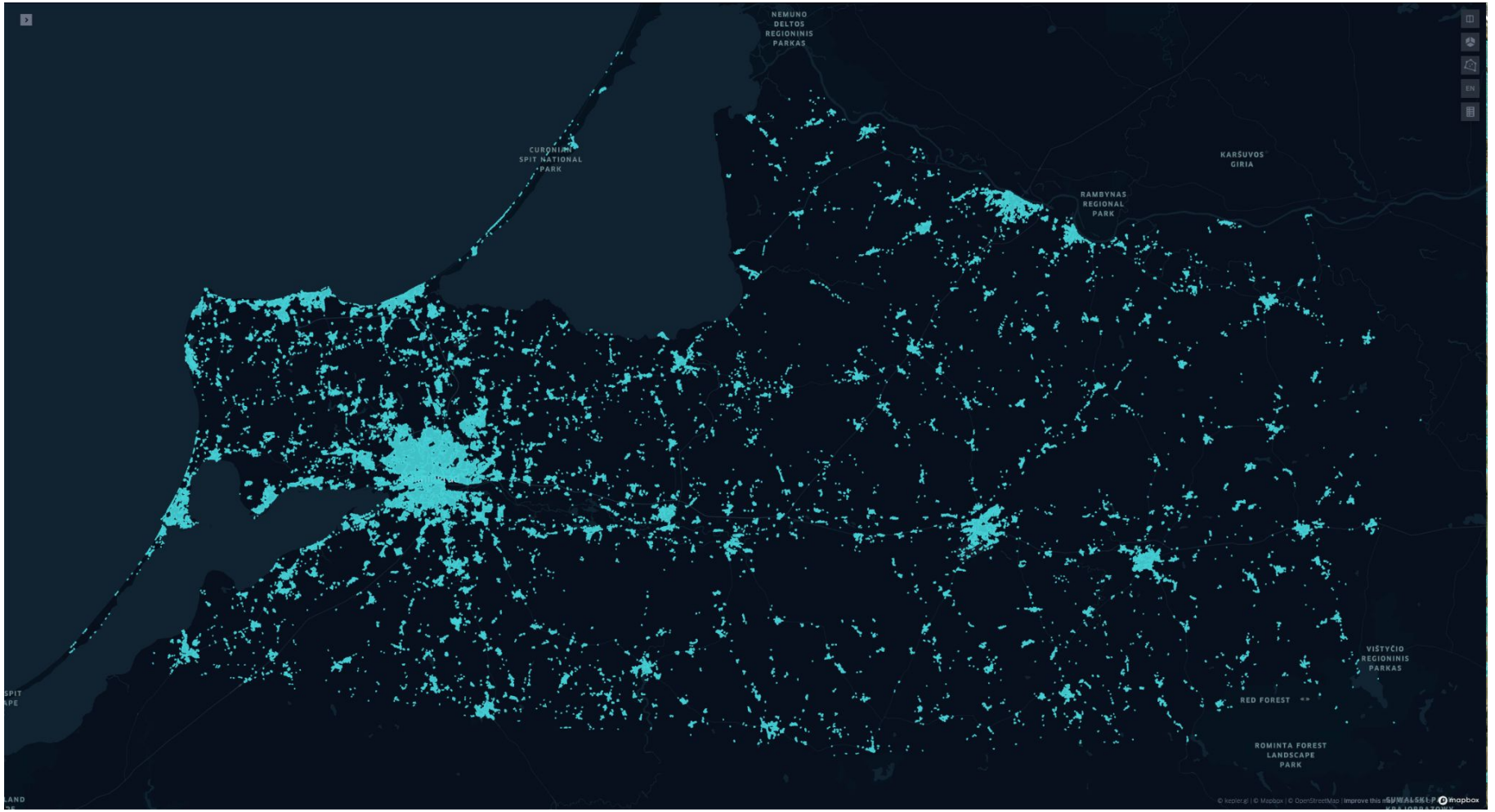


Atlas of Human Settlements

Change Detection over the Baltic States & Kaliningrad

Georgios Ouzounis, Evan Koester, Anthony Perez

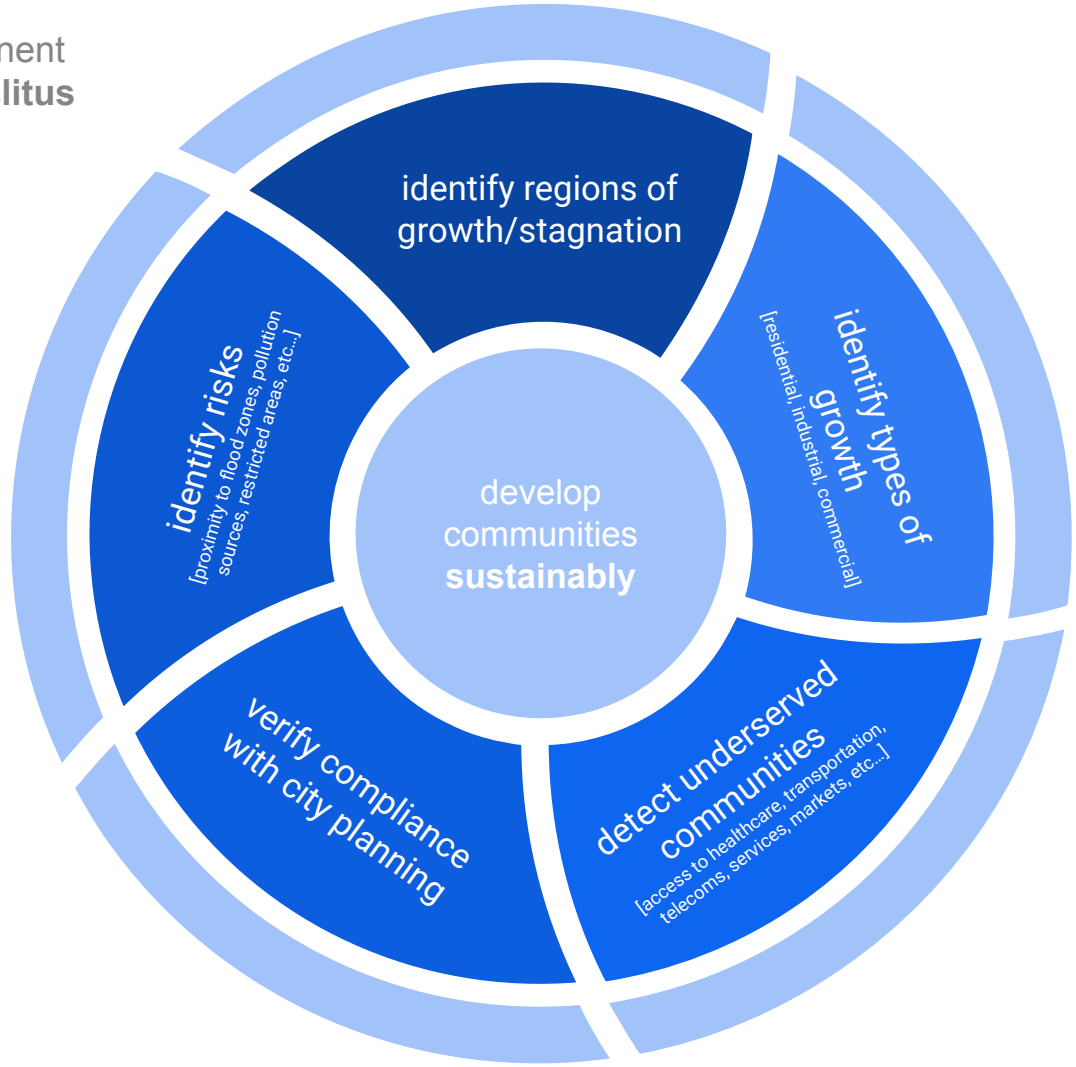
The wider Baltic States - human presence



| wider Baltic States | Estonia | EST Tallinn | Latvia | Lithuania | RUS Kaliningrad |

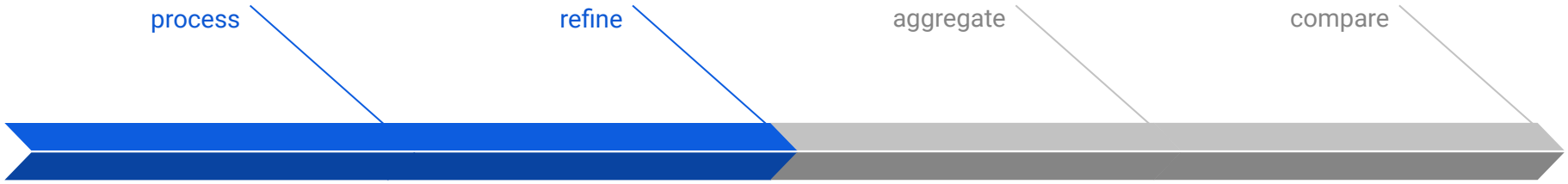
Change Matters!

"There is nothing permanent except change." - **Heraclitus**



Change Detection

Change detection workflow. Blue segments indicate processes on the raster space. Gray bars are for processes on the vector space



feature extraction

Compute AHS model inference on each of the input images

post-process

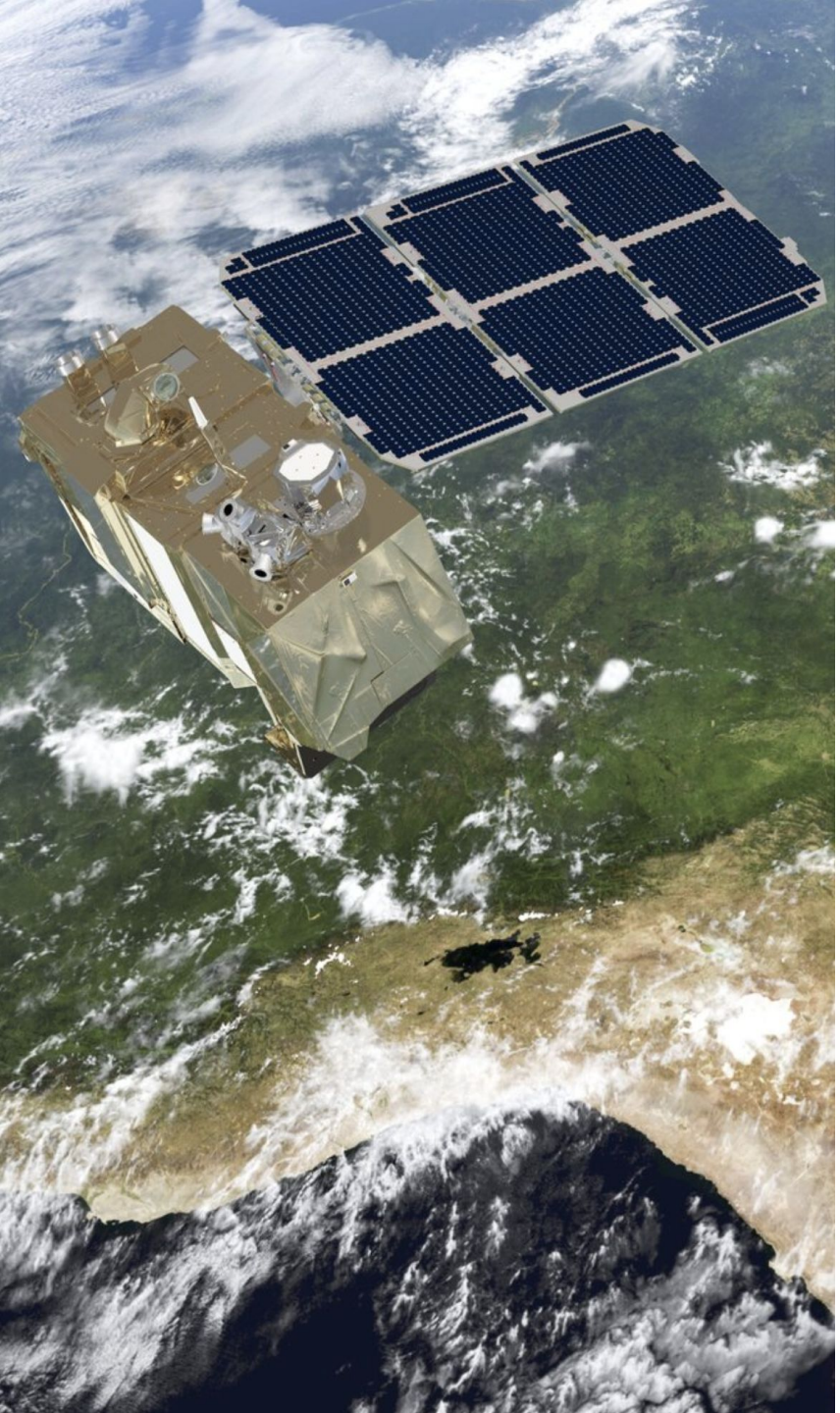
Combine output layers and run post-processing services to optimize quality

compute semantics

Compute semantic layers that can be used in a direct layer comparison schema

compute change

Compute regions of change & quantify change (positive/ negative)



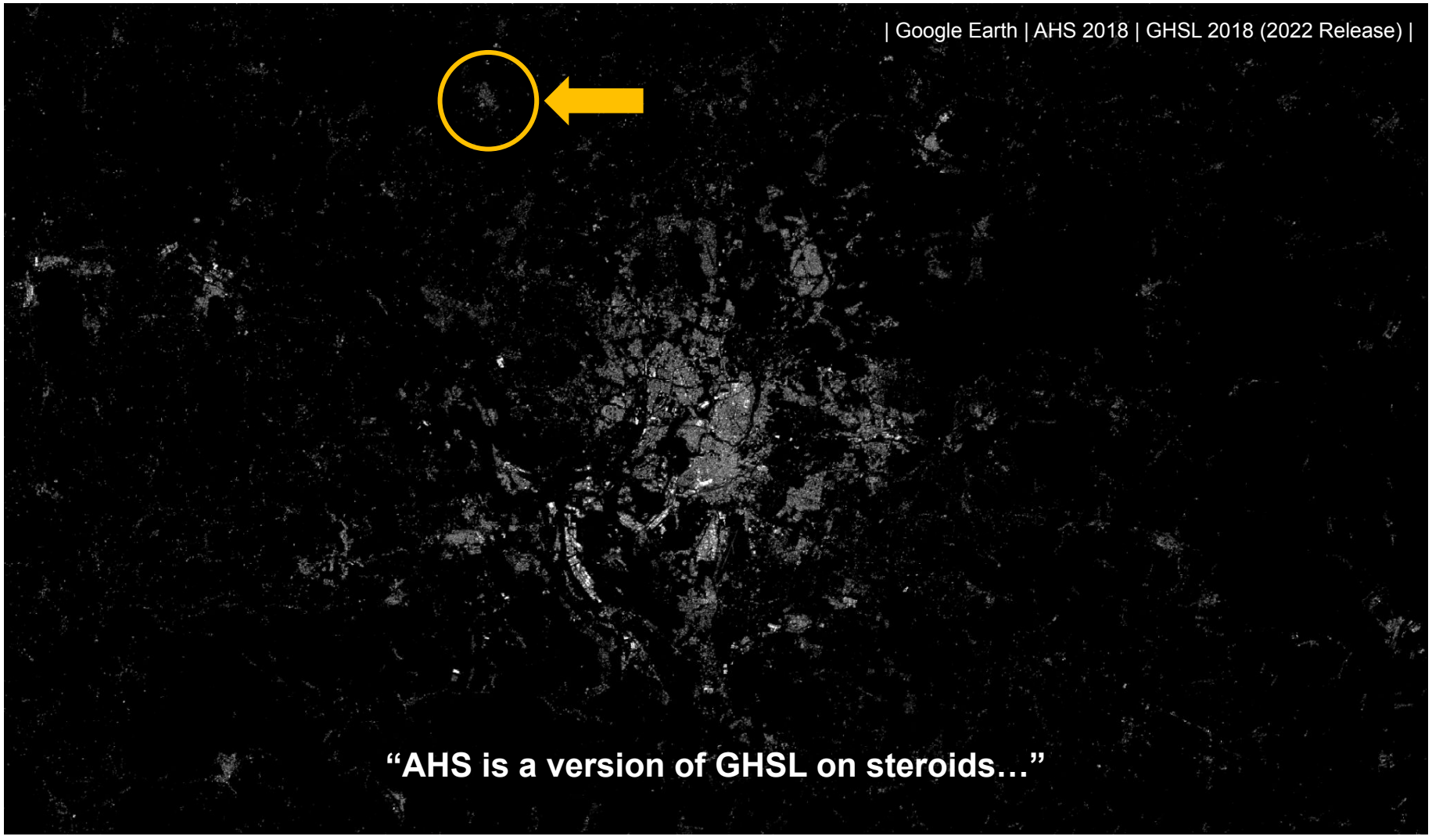
Atlas of Human Settlements

Atlas of Human Settlements

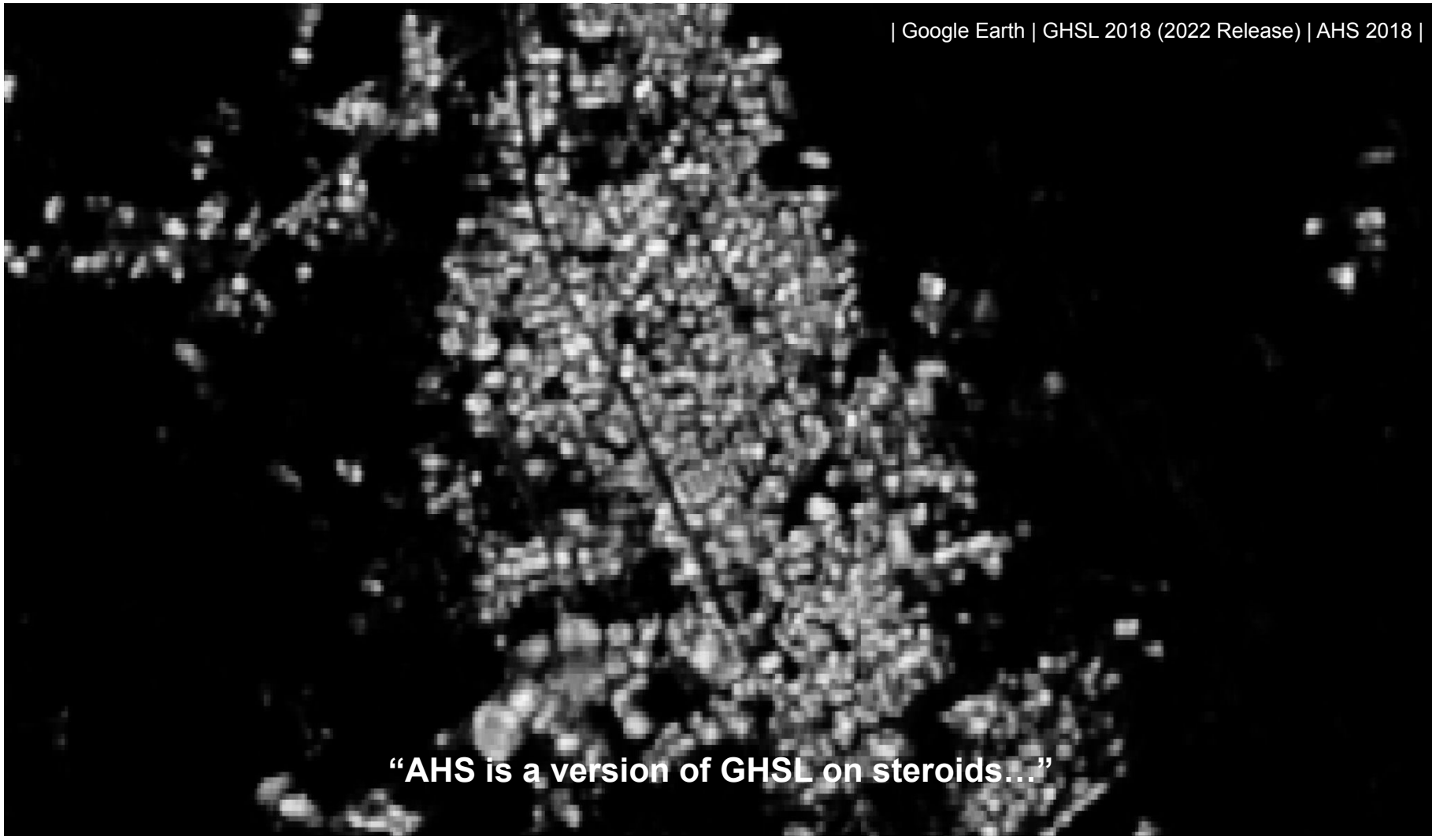
AHS is **built-up** base-map of global coverage, computed from Sentinel-2 annual composites

01	**Production Frequency**	• annually • legacy layers go back to 2015
02	**Spatial Resolution**	• 10m (UTM)
03	**Accuracy**	• > 91% on limited test sets. More to come soon
04	**Base Layers**	• Built-up Confidence (BuC) • Built-up Surface (BuS) • Built-up Index (BuI) • Residential vs Non Residential (RNR)

Comparison against the GHSL



Comparison against the GHSL



AHS - fact sheet

1 technology

AHS is computed using a proprietary **single**, global- coverage model, trained on **billions** of built-up instances (open data) from all across the globe.

2 quality

AHS quality is verified by random sampling; tiles are inspected by humans-in-the-loop. Automated evaluation considers annotated building footprints only.

3 production

AHS lives in the Google Cloud Platform (GCP) ecosystem. Uses sophisticated workflow orchestration for 2-week-long production cycles at minimal cost.

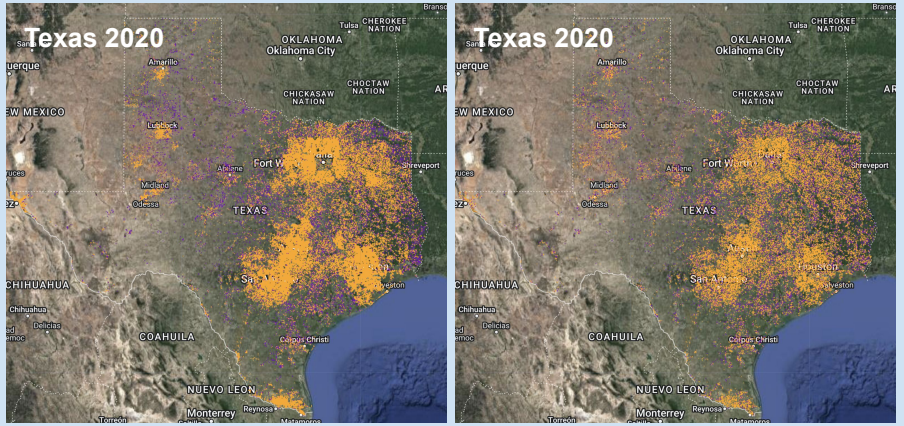
Usage

AHS is a core element of our **Urban Fabric Ontology (UFO)**

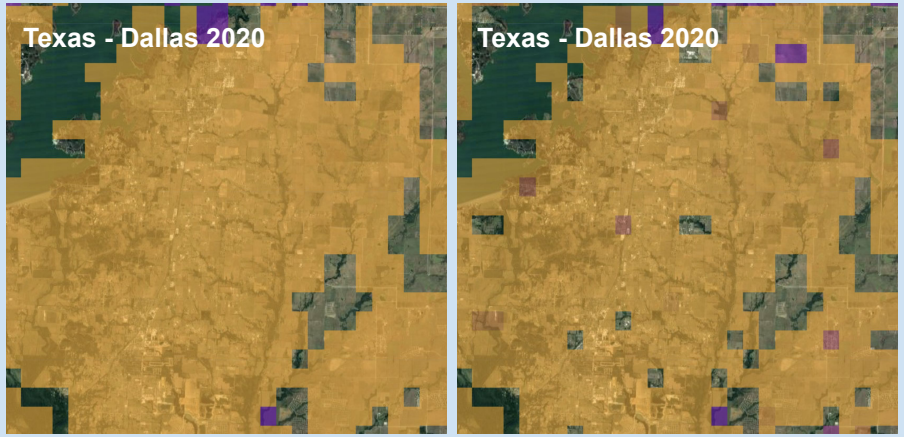
Used for demand intelligence studies in conjunction with a rich set of proprietary socioeconomic indicators.

Beyond that, AHS is used:

- for spatio-temporal settlement monitoring (change detection),
- as a base layer for demographic layers' disaggregation,
- as a core layer for **settlement and population change forecasting**.



(%) change - reference data (%) change - forecasted data



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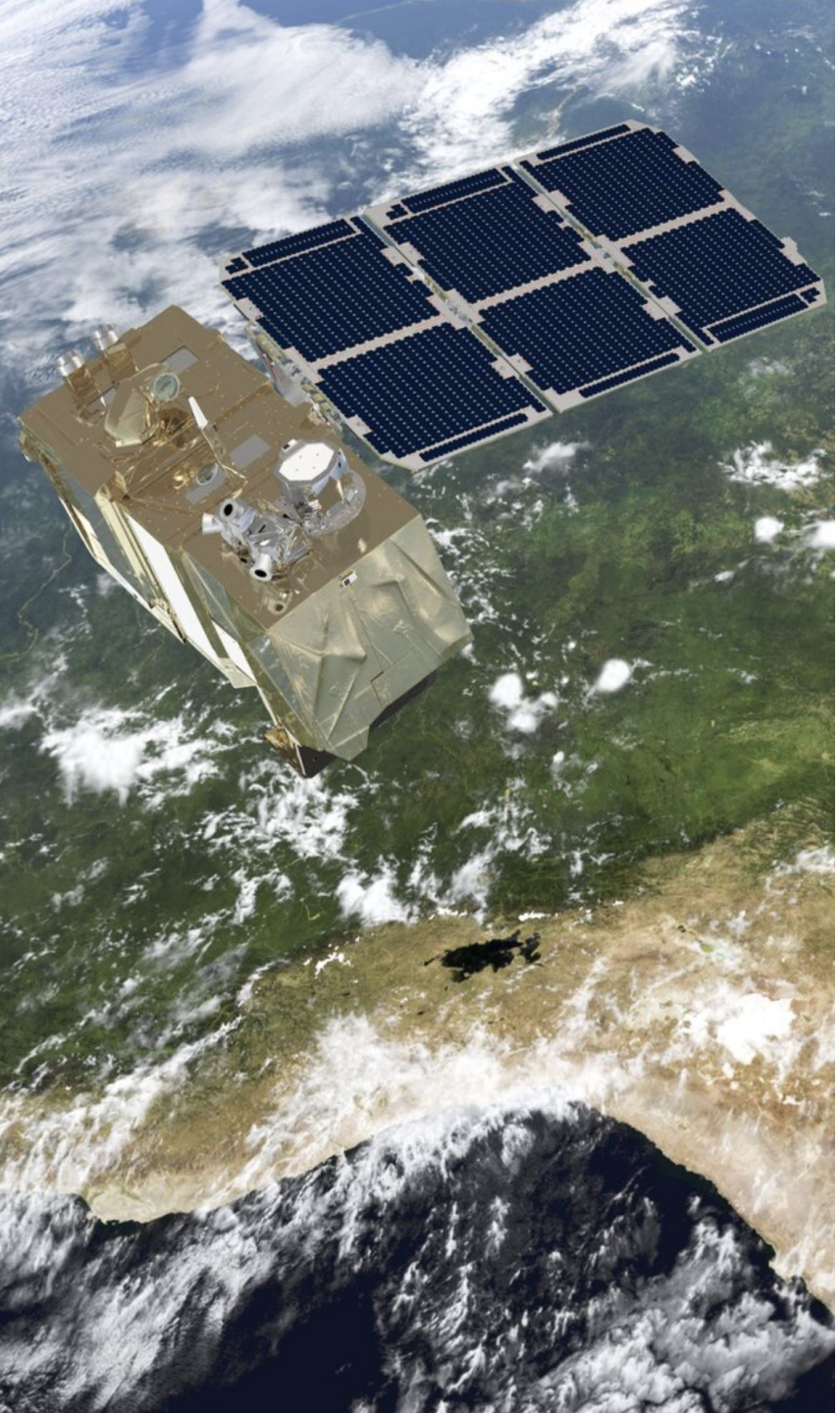


the Baltic States exercise

The exercise

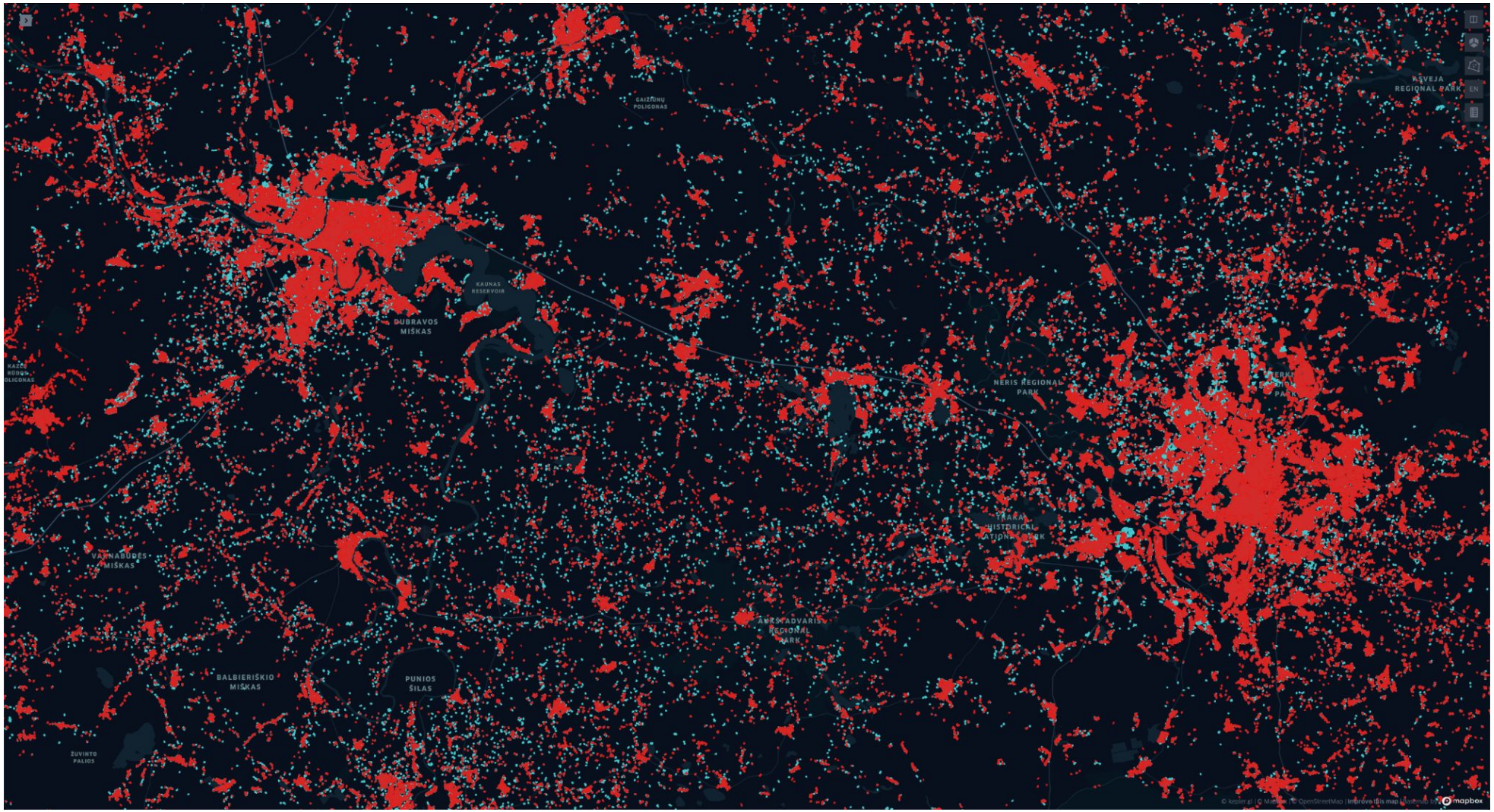
Action Items:

- Produce a temporal stack of AHS for the wider Baltic States over the period 2016 - 2021;
- Compute spatially-aggregated settlement constructs (kernel radius of 50m);
- Compute incremental change and between extreme years (2016, 2021);
- Compute aggregated change (spatial extent of width>= 100m)

All vectors layers, for all years and for all four countries (Estonia, Latvia, Lithuania and Russia - Kaliningrad) are available upon request.

Please reach out to georgios@atlasai.us for access.

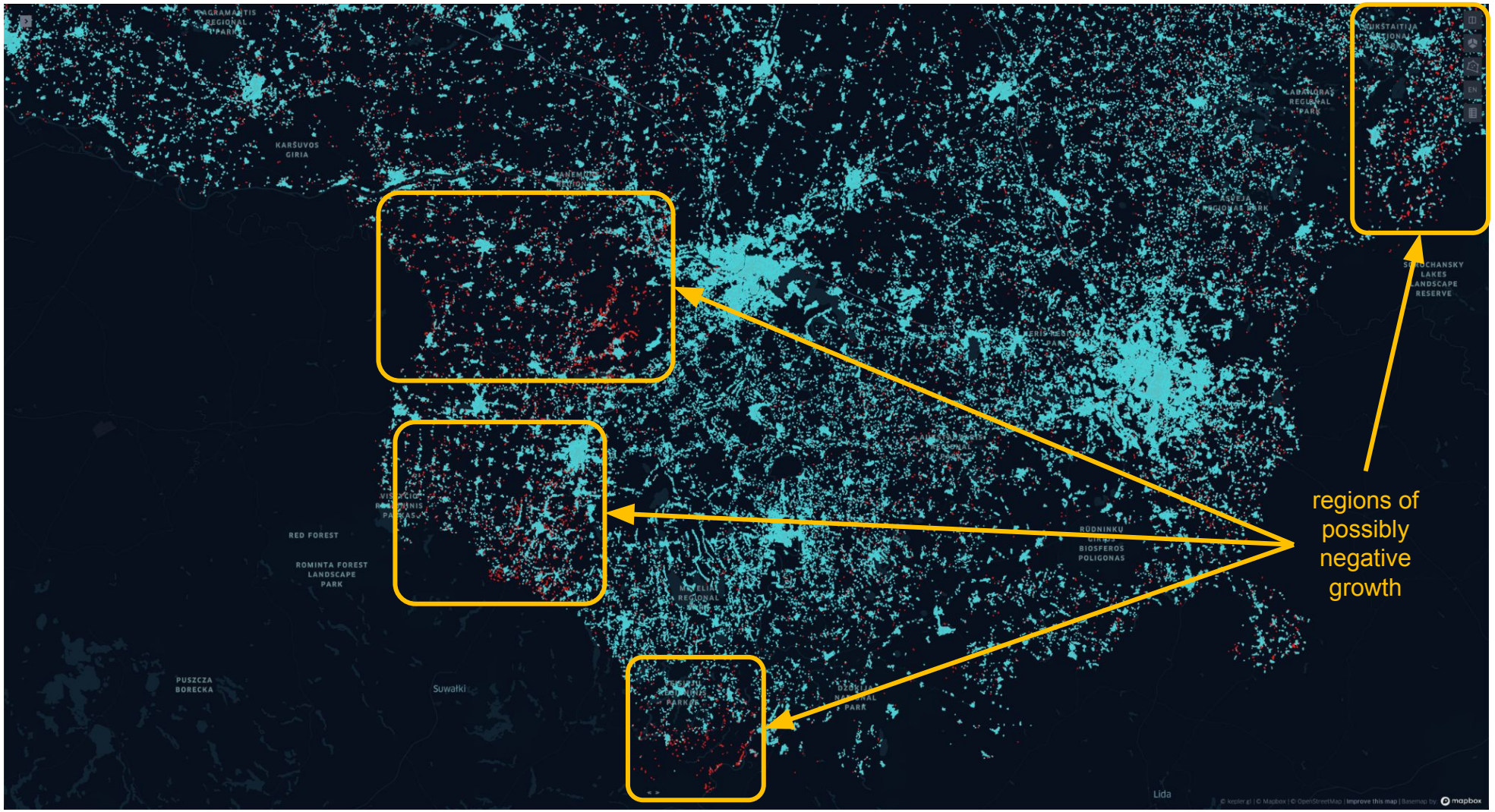
Lithuania - Positive change (cyan)



Built-up in 2016

Additional Built-up in 2021

Lithuania - Negative change (red)



Built-up in 2016

Additional Built-up in 2021

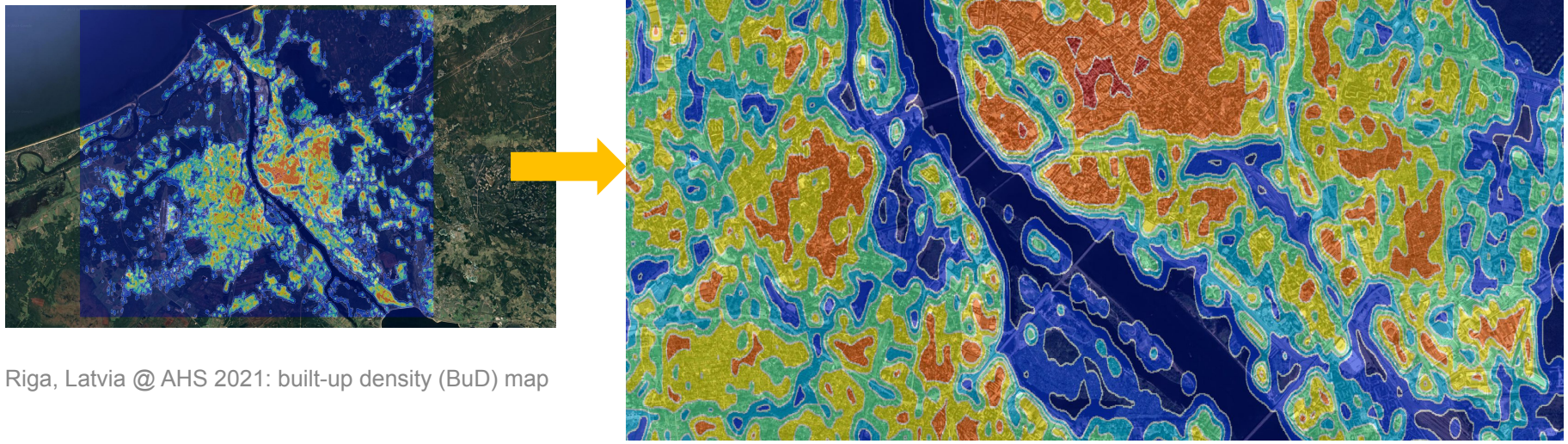
Lithuania - Aggregated positive change (yellow)

Built-up in 2016 Additional Built-up in 2021 Aggregated Built-up change between 2016 and 2021

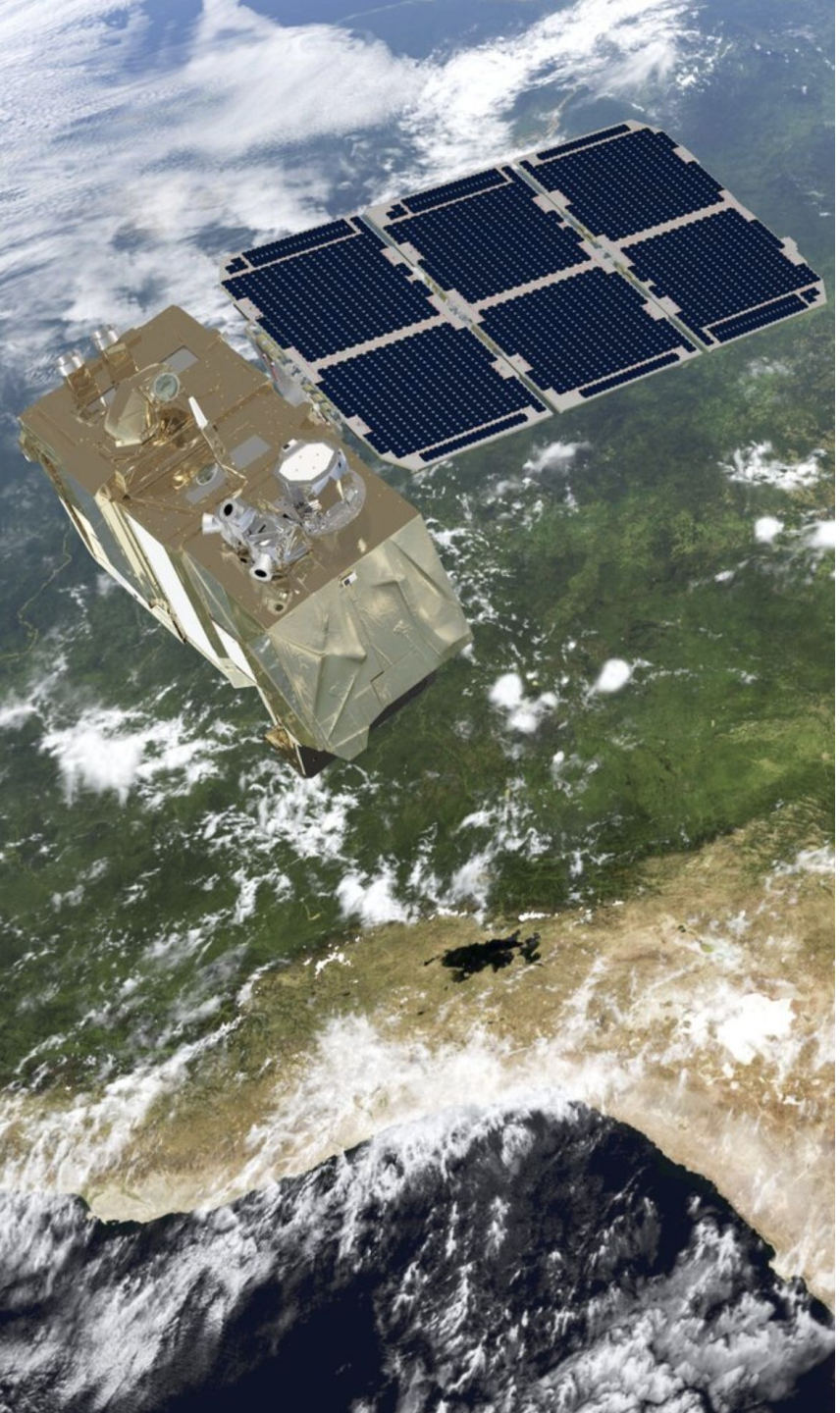
Application tuning

Depending on the application one may wish to fine-tune hyperparameters such as:

1. input layer type [BuS, BuD, BuI, …]
2. input layer thresholds [confidence level, built-up size & shape, …]
3. settlement generalization scale (aggregation kernel size)



Riga, Latvia @ AHS 2021: built-up density (BuD) map



Thank you

Do you want to get involved? Contact us at **info@atlasai.us**