CHAP

ChinaHighAirPollutants
中国高分辨率高质量近地表空气污染物数据集

CHAP

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ChinaHighAirPollutants (CHAP)

New update: <u>Daily seamless 1 km PM$_x$ and composition data released!</u>

- **Brief Introduction**

The ChinaHighAirPollutants (CHAP) dataset refers to the **long-term**, **full-coverage**, **high-resolution**, and **high-quality** datasets of ground-level air pollutants for China. It is generated from the big data (e.g., ground-based measurements, satellite remote sensing products, atmospheric reanalysis, and model simulations) using artificial intelligence by considering the spatiotemporal heterogeneity of air pollution. The CHAP dataset contains **7** major air pollutants (i.e., **PM$_1$**, **PM$_{2.5}$**, **PM$_{10}$**, **O$_3$**, **NO$_2$**, **SO$_2$**, and **CO**), and **PM$_{2.5}$** compositions (e.g., **SO$_4^{2-}$**, **NO$_3^-$**, **NH$_4^+$**, **Cl$^-$**, and **BC**, et al). This CHAP dataset is **public** and **freely** open to all users!

- **Dataset summary**

ChinaHighAirPollutants (CHAP)								
Air Pollutant	Main predictor	Spatial resolution	Missing values	Temporal resolution				Available period (yyyy/mm)
				Hourly	Daily	Monthly	Yearly	
PM$_1$	Big data	1 km	No		√	√	√	2000/01 – 2021/12
PM$_{2.5}$	Big data	1 km	No		√	√	√	2000/01 – 2021/12
	Himawari-8	5 km	Yes	√	√	√	√	2018/01 – 2018/12
PM$_{10}$	Big data	1 km	No		√	√	√	2000/01 – 2021/12

Website: https://weijing-rs.github.io/product.html

ChinaHighPM$_{2.5}$ (Method & Updates)

Flowchart of STET model (Wei et al., RSE, 2021)
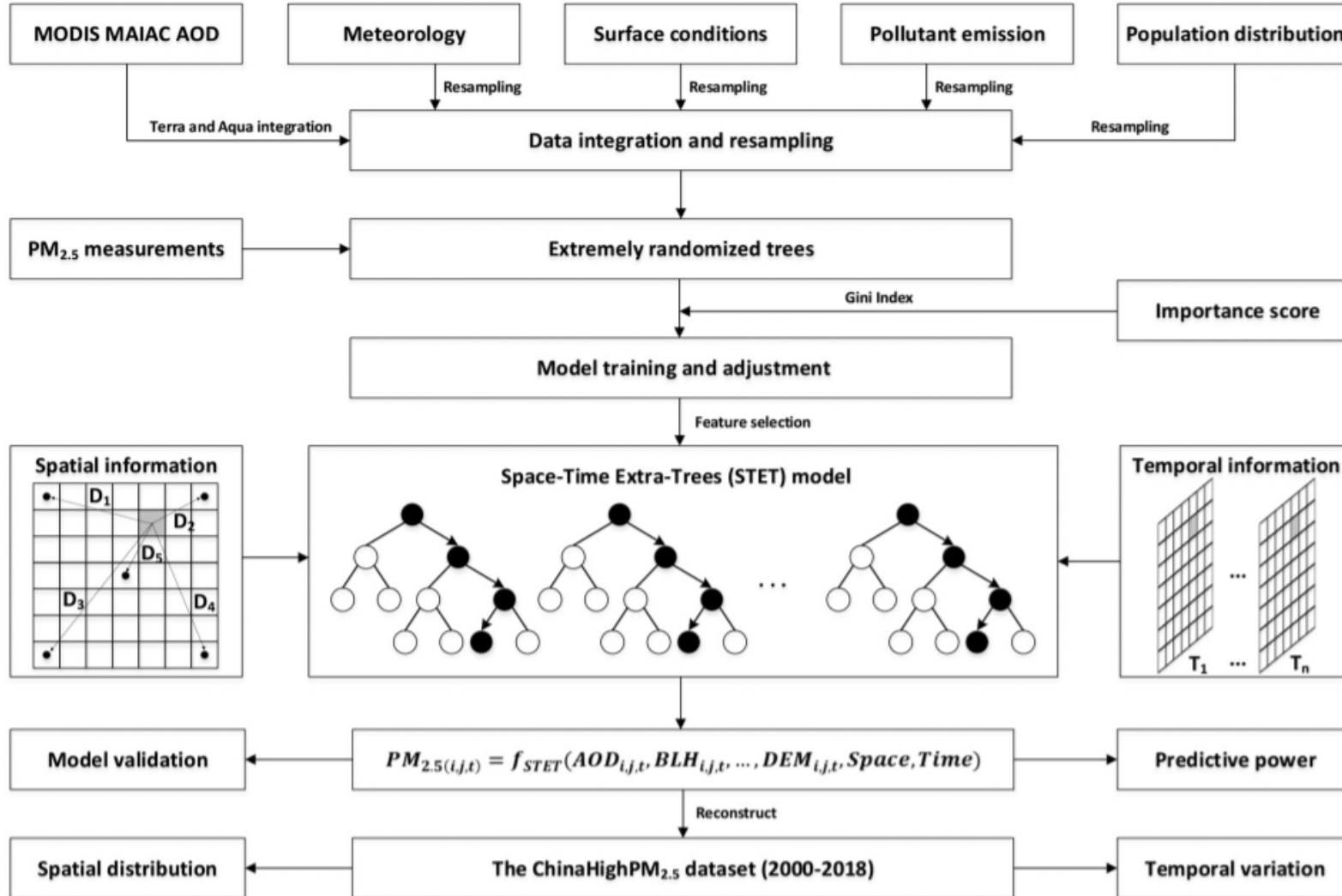
Method

Space-Time Extra-Trees (STET) model

Main updates (Version 4)

1) AOD gap filling:
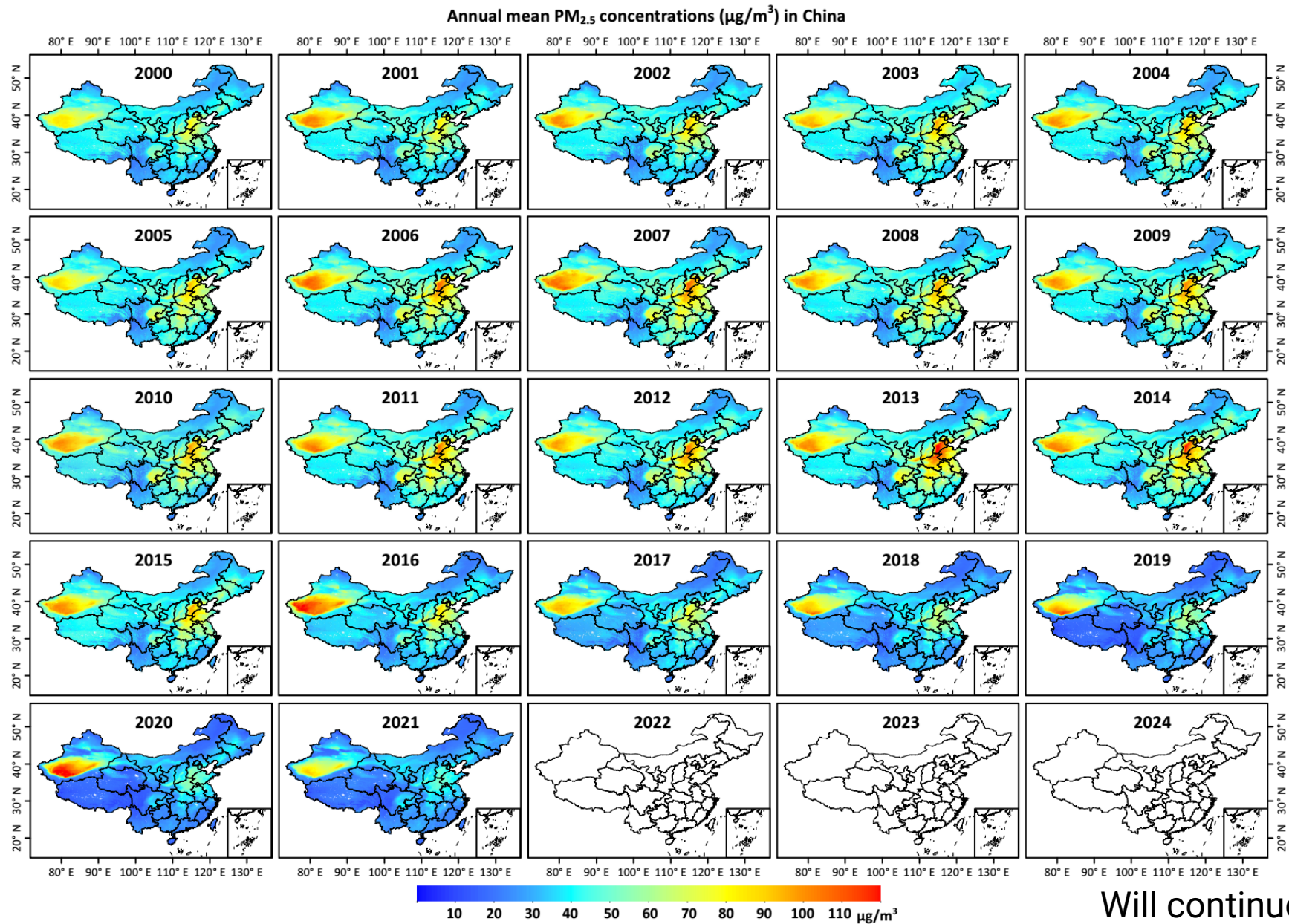
Fill the AOD gaps from big data using machine learning

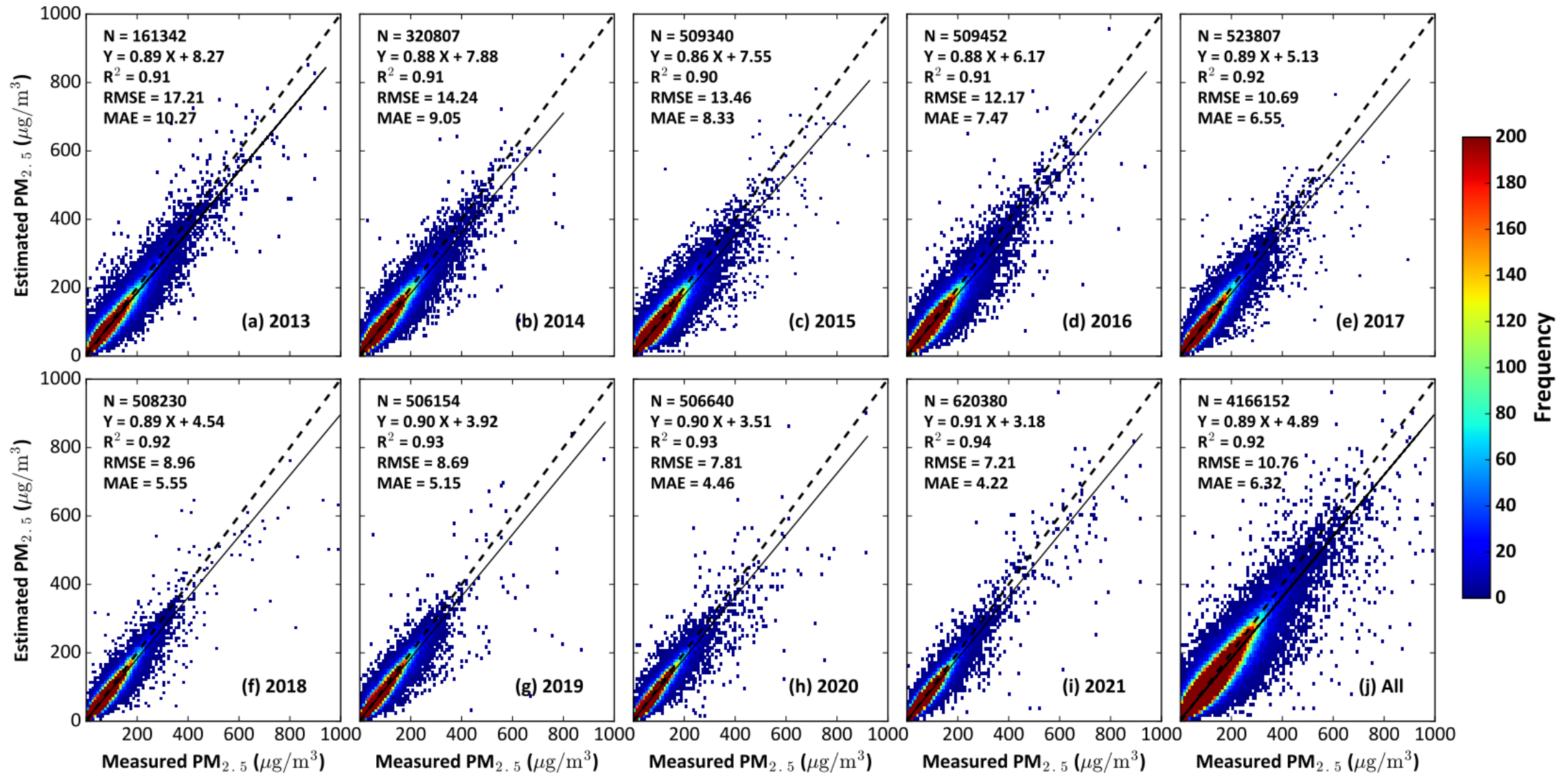2) Update data sources

e.g., MERRA2 PM$_{2.5}$ compositions

CAMS emission inventory

ChinaHighPM$_{2.5}$ (1 km, 2000-2021, Version 4)

Annual mean PM$_{2.5}$ concentrations (µg/m^3) in China
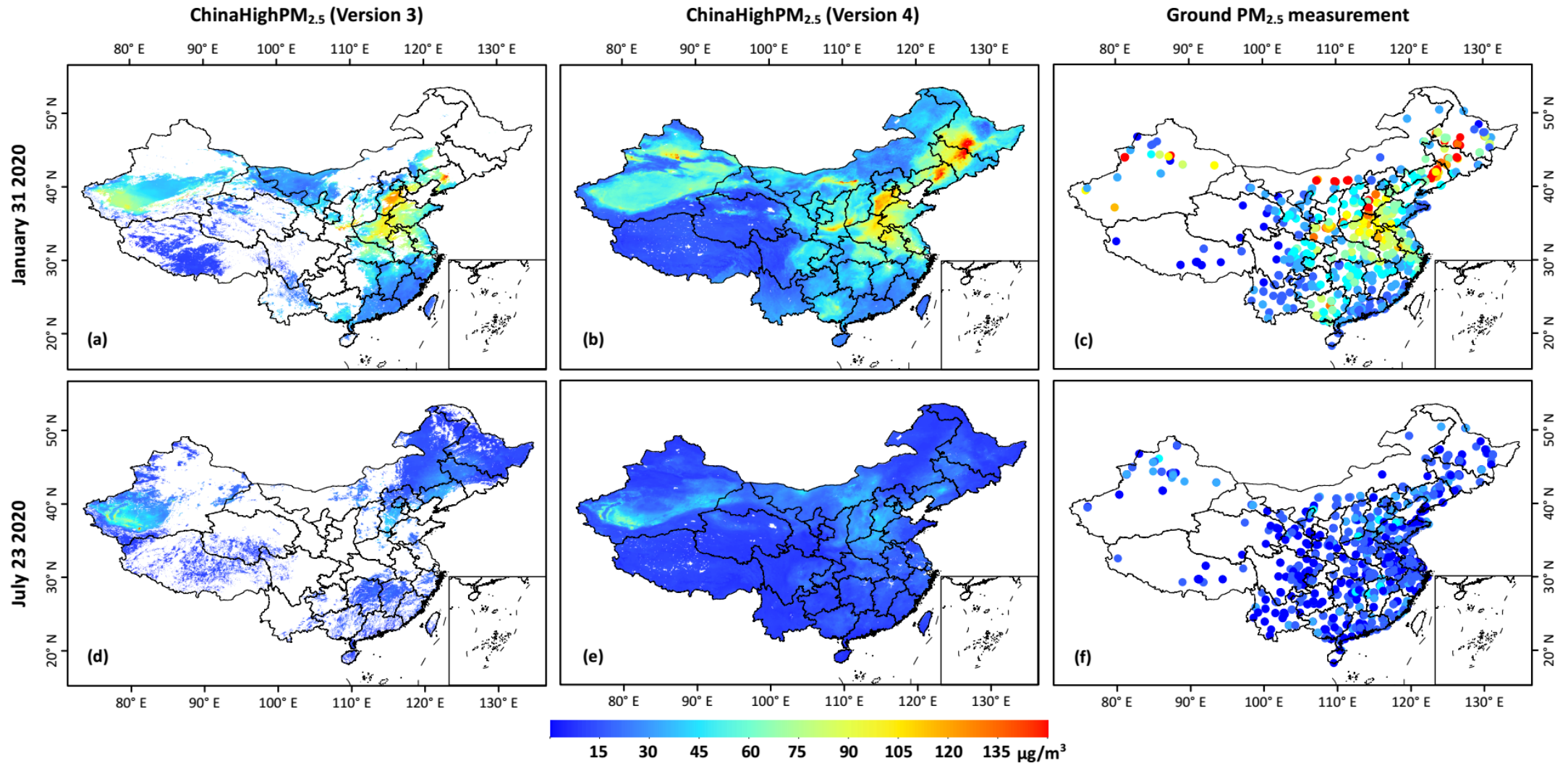

Will continuously update!

10-fold Cross Validation

Overall accuracy: CV-R^2 = **0.92**, RMSE = **10.76** μg/m^3

Version Comparison (4 & 3)

The V4 data filled the missing values of satellite AOD products and provided **seamless** daily PM$_{2.5}$ concentrations across China, significantly improving the data availability by **60%** compared to the V3 dataset.

ChinaHighPM₂.₅ product (format)

Format: CHAP_PM2.5_D1K_20200101_V4.nc

PM2.5: ground-level PM₂.₅

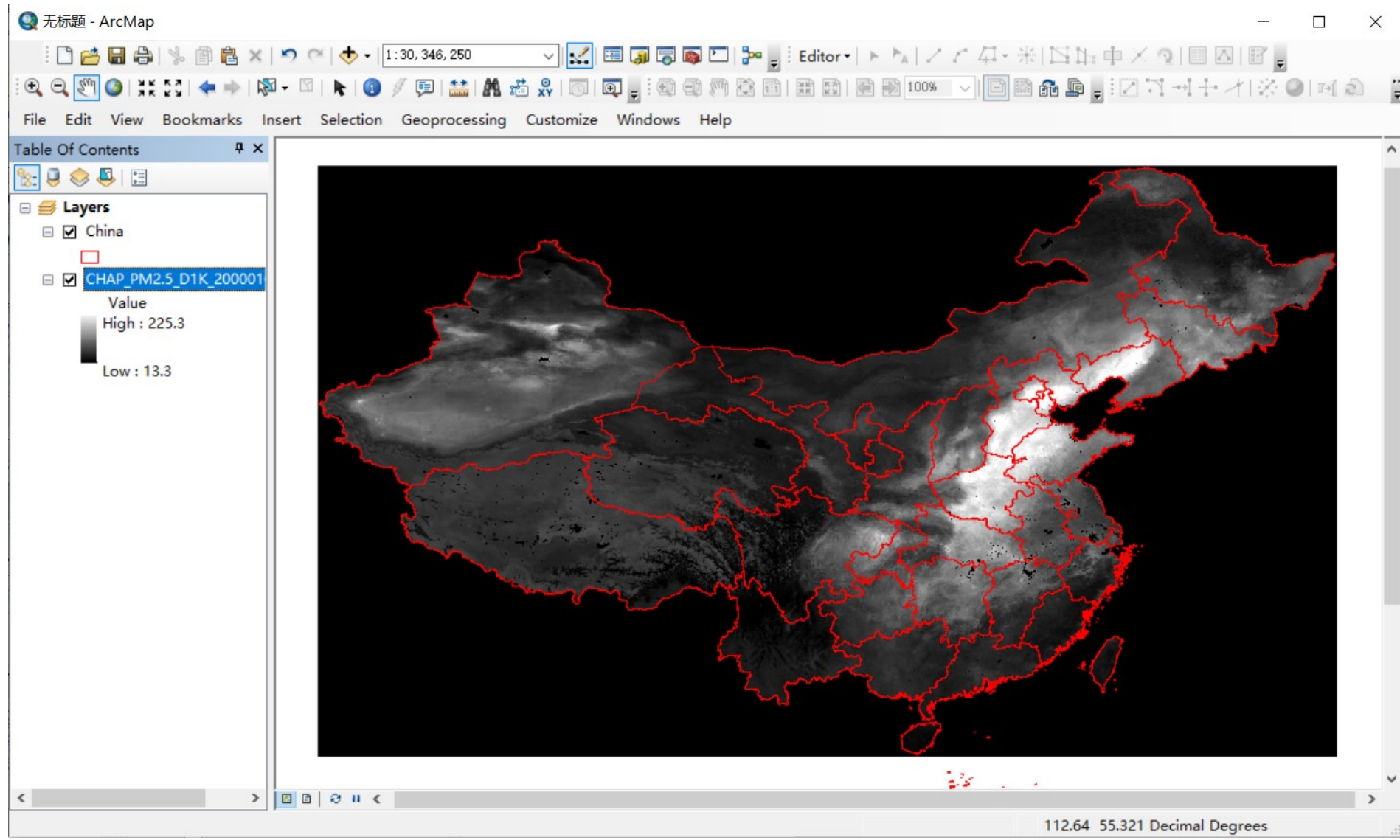**D1K:** Daily 1 km (**M1K**: Monthly 1 km; **Y1K**: Yearly 1 km)

20200101: Date [Year, Month, Day]

V4: Version 4

Check the .nc file using **Panoply** or **HDF Explorer**

How to read?

Use Python, Matlab, and IDL codes (nc2geotiff codes.rar) to batch convert NetCDF (.nc) to GeoTIFF (.tif).

Reference

[1] Wei, J., Li, Z., Lyapustin, A., Sun, L., Peng, Y., Xue, W., Su, T., and Cribb, M. Reconstructing 1-km-resolution high-quality $PM_{2.5}$ data records from 2000 to 2018 in China: spatiotemporal variations and policy implications. *Remote Sensing of Environment*, 2021, 252, 112136. https://doi.org/10.1016/j.rse.2020.112136

[2] Wei, J., Li, Z., Cribb, M., Huang, W., Xue, W., Sun, L., Guo, J., Peng, Y., Li, J., Lyapustin, A., Liu, L., Wu, H., and Song, Y. Improved 1 km resolution $PM_{2.5}$ estimates across China using enhanced space-time extremely randomized trees. *Atmospheric Chemistry and Physics*, 2020, 20, 3273–3289. https://doi.org/10.5194/acp-20-3273-2020

Contact

If you use the ChinaHighPM$_{2.5}$ dataset for related study, please cite the corresponding reference (Wei et al., RSE, 2021; Wei et al., ACP, 2020). **Note that this dataset is continuously updated, and if you need more data or have any questions, please contact me (weijing_rs@163.com; weijing.rs@gmail.com).**