GLOBAL WATERPACK

OPEN SURFACE WATER TIME SERIES FOR THE ASSESSMENT OF CLIMATE AND HUMAN IMPACTS ON A GLOBAL SCALE

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Global WaterPack Time Series

The Global WaterPack (GWP) is a daily, global time series of open surface water extent covering the period 2003 until today. The Global WaterPack is based on remote sensing surface reflectance data of the Moderate-resolution Imaging Spectro-radiometer (MODIS) and features a spatial resolution of 250 m.

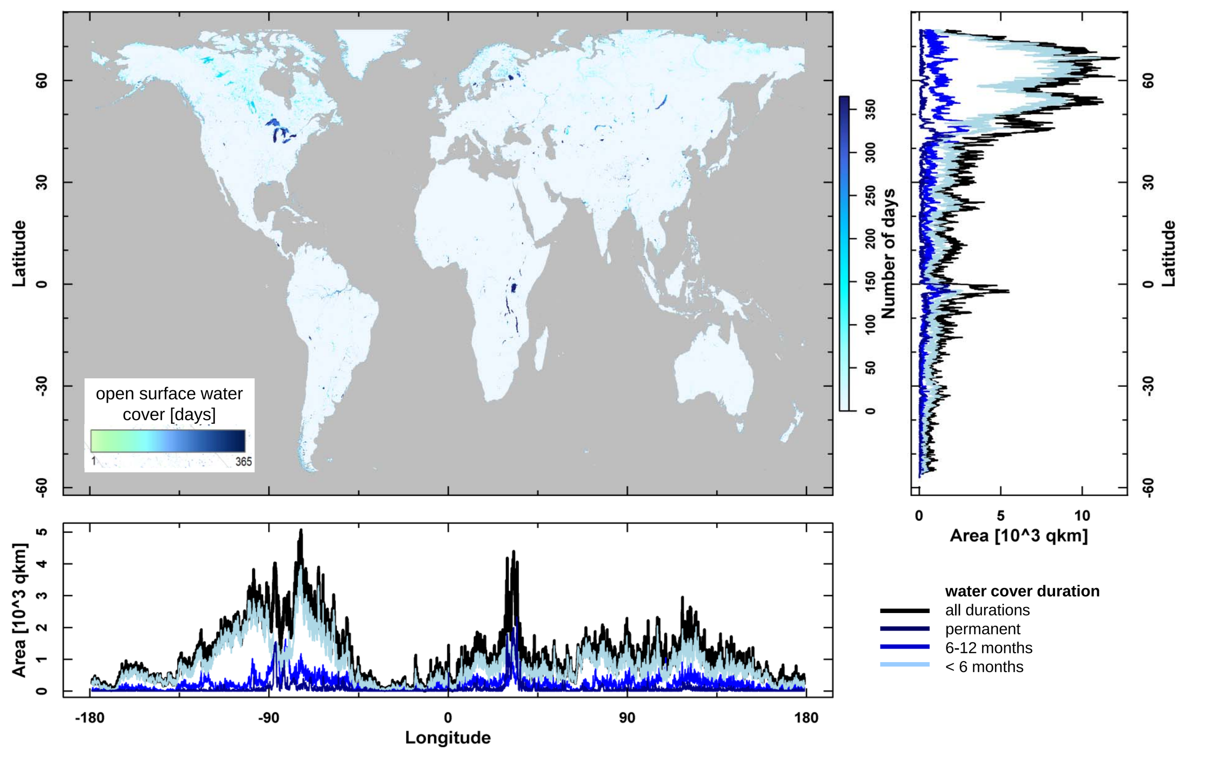

Fig. 1: Global WaterPack 2014. Global distribution of permanent and seasonal water bodies.

For water classification based on daily reflectance data a methodology was developed which includes a dynamic thresholding approach and temporal interpolation for cloud and data gaps. Figure 2 gives an overview of this approach, more details can be found in Klein et al. (2017).

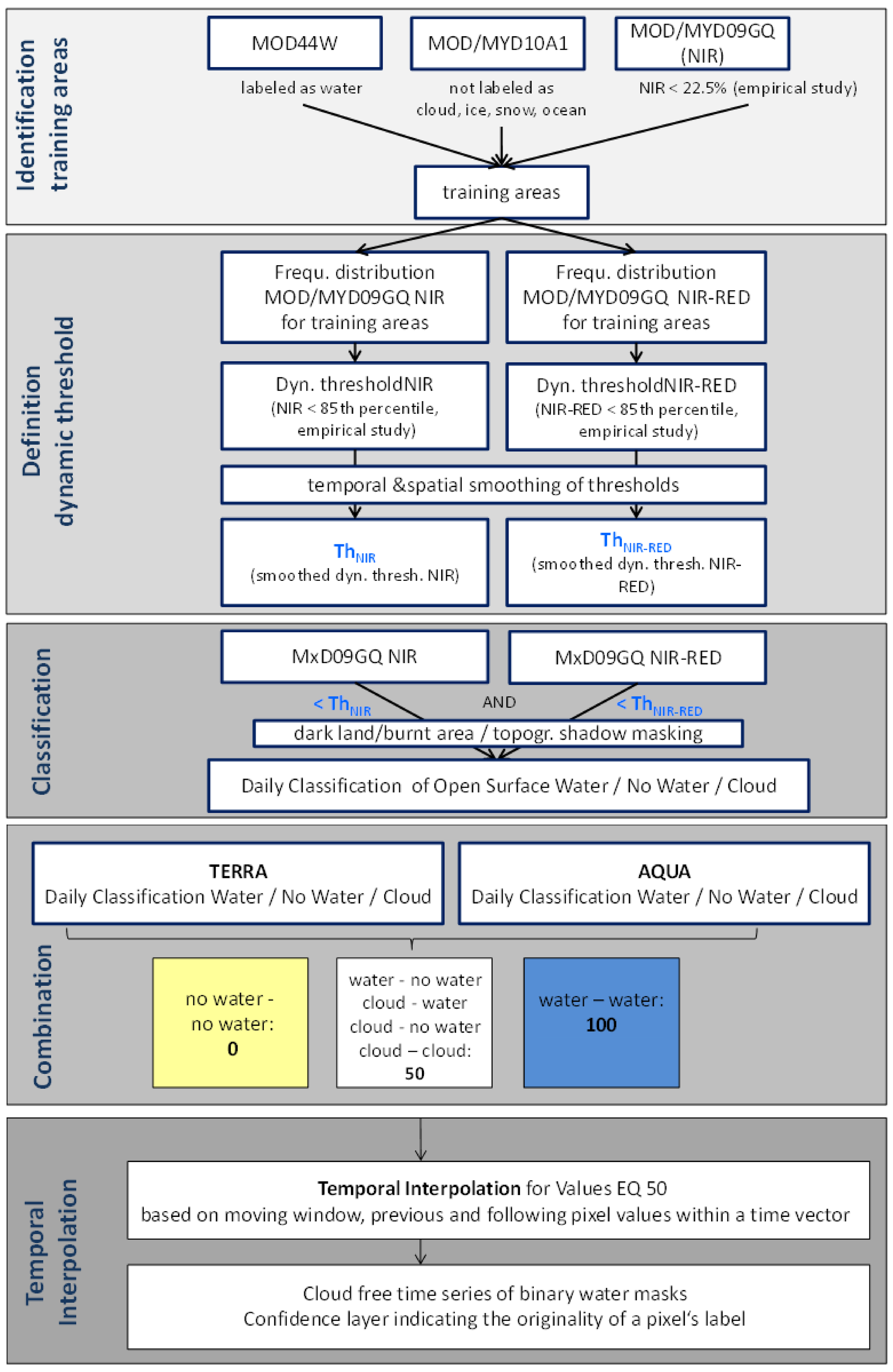

Fig. 2: Methodological workflow for the derivation of the Global WaterPack time series.

Global WaterPack for Climate-Related Assessments

A major value of the GWP lies in its high temporal resolution and consistent availability for more than 15 years. The daily dataset can for example improve calibration, data assimilation and validation of climate and hydrological models with typically high temporal resolution. The daily information of the GWP can reveal new insights into the impact of climate change, meteorological variability and human activities on surface water dynamics, freezing and thawing cycles, freshwater availability and respective implications for ecosystems and human livelihoods. Selected examples on how climatic and human effects on water body dynamics are expressed in the GWP are shown in Figure 3 and Figure 4.

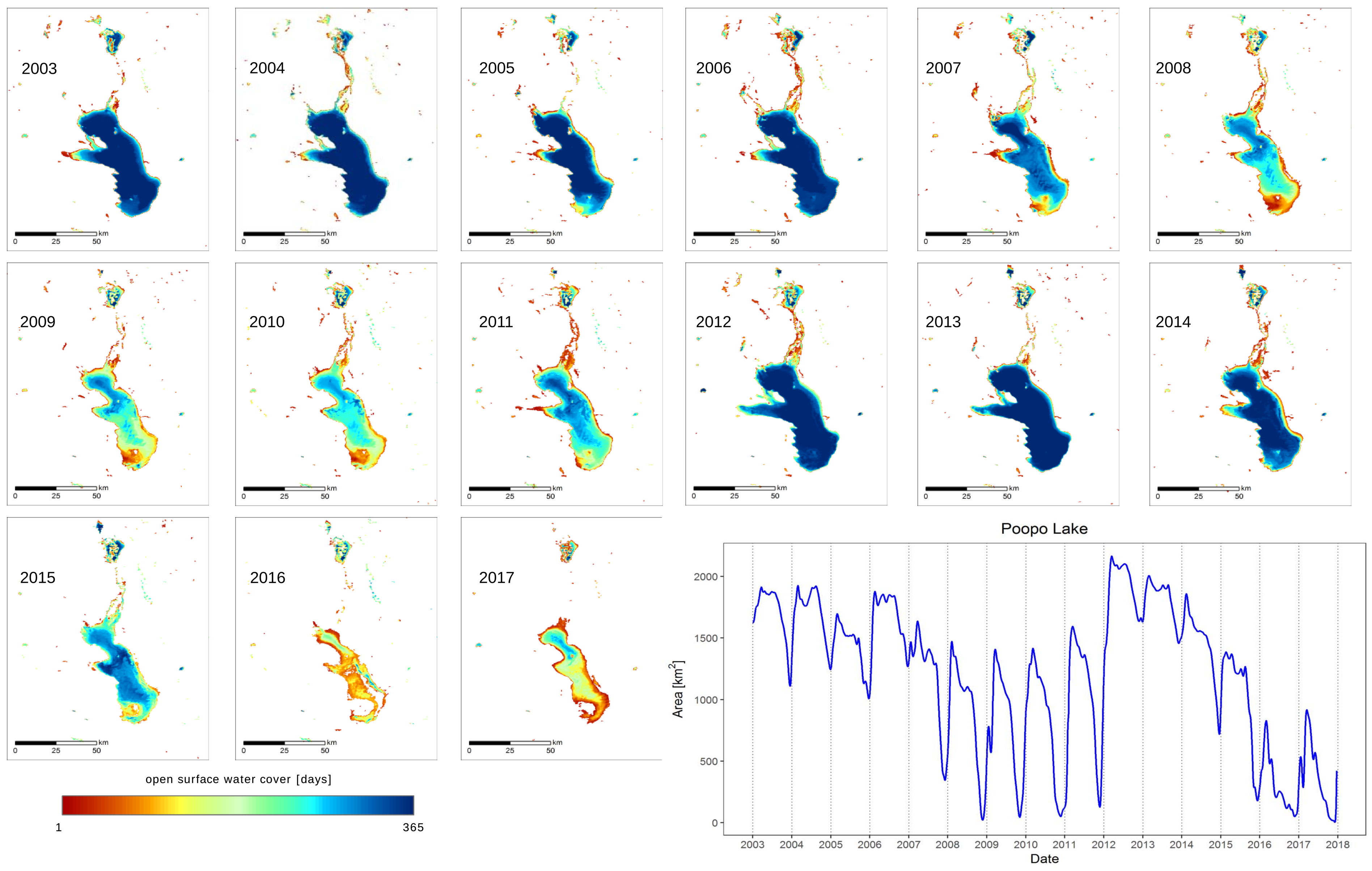

Fig. 3: Open surface water dynamics for Lake Poopo, Bolivia, between 2003 and 2017. The high spatial and temporal dynamics of surface water strongly depend on precipitation variability and melting water inflow. The reasons for the recent shrinking of the lake can be found in recurrent droughts and utilization of water sources for mining and agriculture.

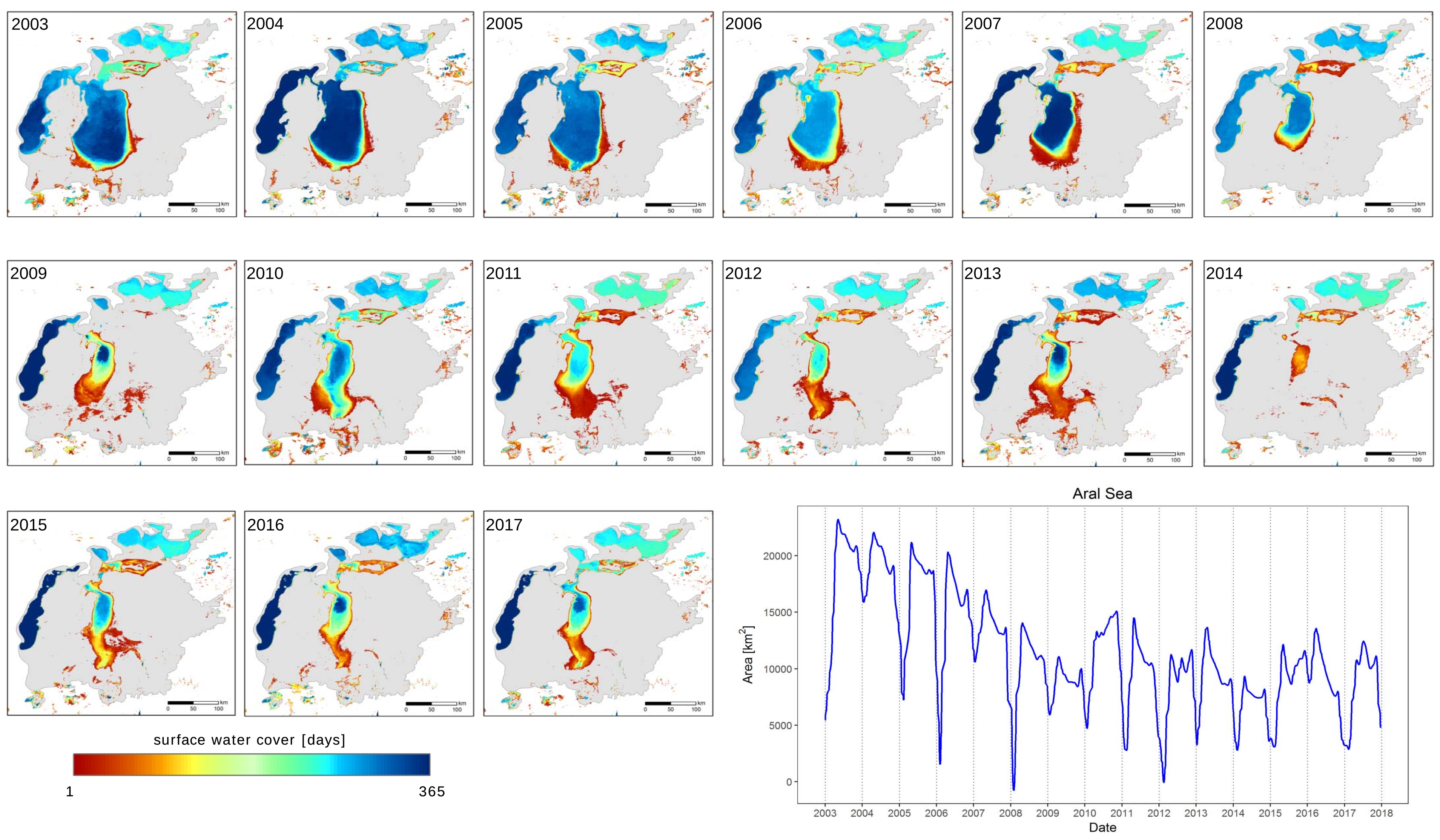

Fig. 4: Development of the Aral Sea between 2003 and 2017. The GWP shows that the Aral Sea has been shrinking by more than 40% during the last 15 years. Different factors including annual winter temperatures (freezing-thawing cycles), amount of melting water and evaporation rates during summer lead to irregular seasonal dynamics of the lake, which is particularly visible for the almost dried out Eastern lobe of the South Aral. Here the Global WaterPack can contribute to temporally detailed analyses in regards to climate change and variability impacts on open surface water.

References

Klein, I.; Gessner, U.; Dietz, A.J.; Kuenzer, C. (2017): Global WaterPack – A 250 m resolution dataset revealing the daily dynamics of inland water bodies. Remote Sensing of Environment 198, 345-362.

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