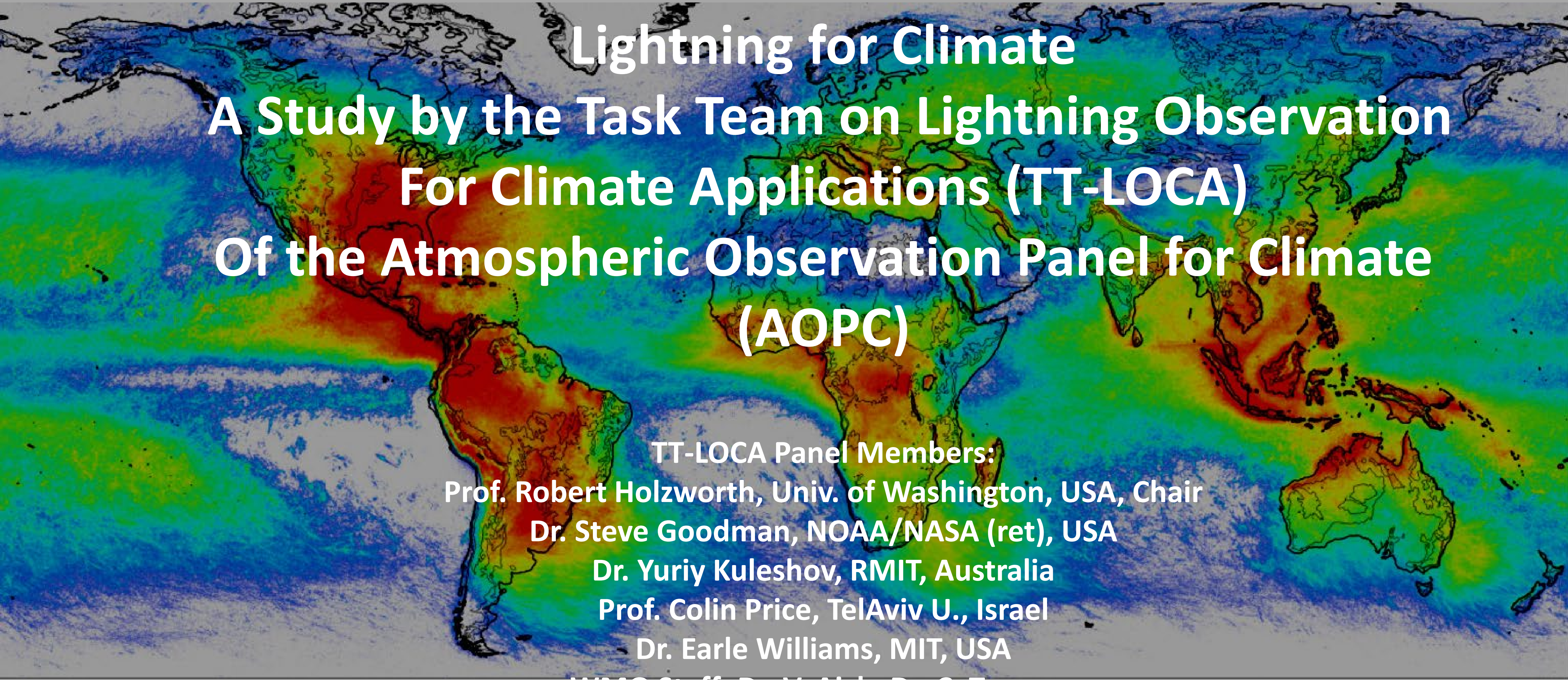

Lightning for Climate
A Study by the Task Team on Lightning Observation For Climate Applications (TT-LOCA) Of the Atmospheric Observation Panel for Climate (AOPC)

TT-LOCA Panel Members:

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Why Lightning for Climate?

Due to the relevance of lightning data, and potential for use as a climatological variable, lightning has been added to the list of Essential Climate Variables (ECV) in the **2016 GCOS Implementation Plan (IP) (GCOS, 2016),**

including a first attempt to define the requirements for climate monitoring of lightning measurements.

Action 29 of the IP called for defining "**the requirement for lightning measurements, including data exchange, for climate monitoring and to encourage space agencies and operators of ground based systems to strive for global coverage and reprocessing of existing datasets".**

The TT-LOCA was constituted to address these questions.

(TT-LOCA = task-team on lightning observations for climate applications)

Recommendations:

2.1 Observations of Lightning
2.2 Data Archival
2.3 Non-governmental Lightning Data
2.4 Metadata requirements
2.5 Thunder Day Observations
2.6 Global Electric Circuit
2.7 Schumann Resonances

2.1 Observations of Lightning

Satellite and Ground Based
Systems use different technologies and are complementary

2.2 Data Archival

It is not suggested that governments attempt to archive all, high resolution lightning observations, but perhaps daily average gridded data could be maintained by WMO or other freely accessible location.

2.3 Non-governmental Lightning Data

We note that the vast majority of high resolution lightning data are owned privately, so careful consideration should be given to incentivize and collaborate with private lightning data holders to share gridded data at low spatial and time resolution

2.4 Metadata requirements

We note that no network is 100% efficient at locating every single lightning stroke. Therefore it is absolutely required that data sets be provided with sufficient metadata (about numbers of sensors currently functioning, station locations, detection efficiency estimates, and other calibration data necessary to make the data sets useful in climate studies.

Related Observations also needed:

2.5 Thunder Day Observations

Thunder Day data can extend lightning climatology well back into the 20th century

2.6 Global Electric Circuit

The global circuit is driven by thunderstorms, and therefore can be used to summarize global electrification changes

2.7 Schumann Resonances

Lightning stimulates the earth-ionosphere wave guide to ring like bell with standing waves (at ELF frequencies). Time variations of the power in these Schumann Resonances gives information on cumulative lightning activity.

Note about TT-LOCA

Task Team was constituted to include experts working in lightning research and observations. We held invited discussions with industry representatives of private lightning networks. Face to face meetings were held and active on-line discussions of major topics were conducted. The Draft report was approved by all TT members.

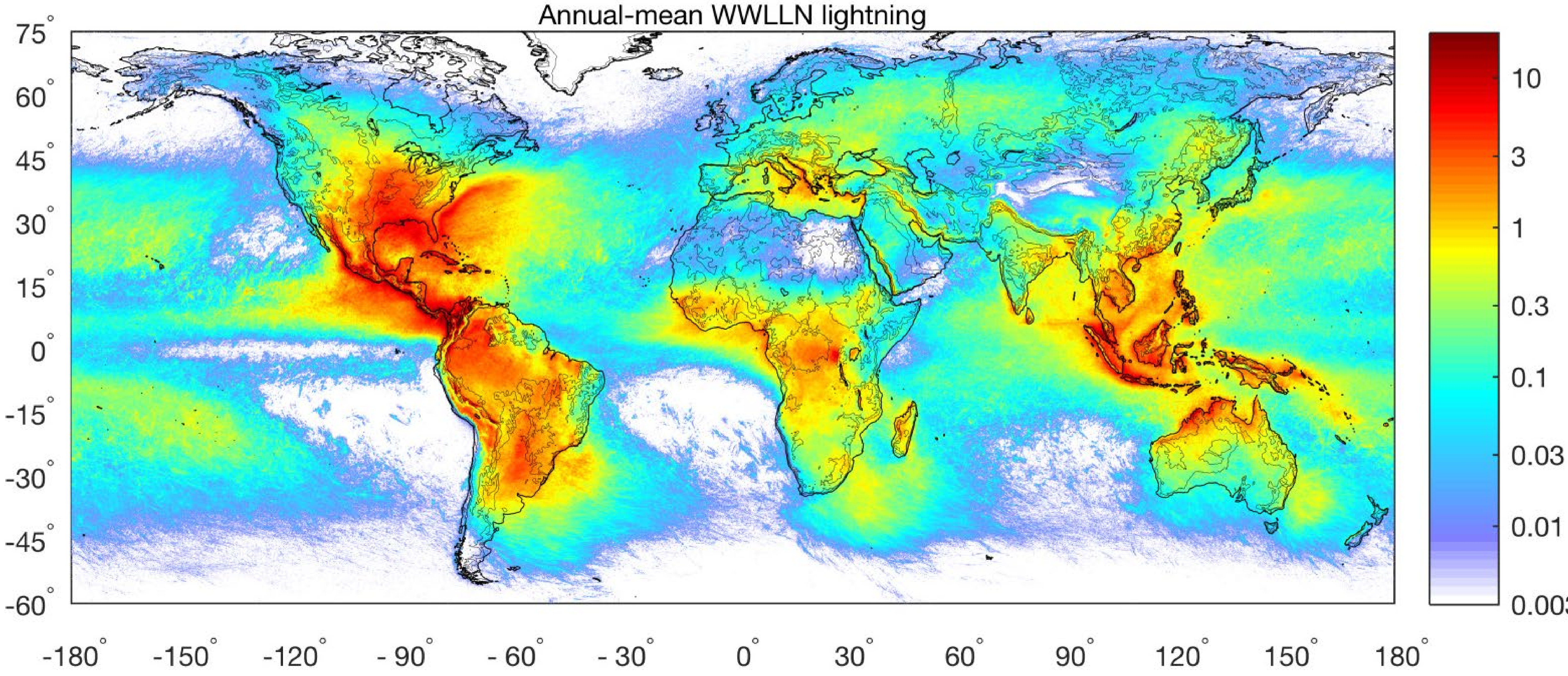

Figure: Number of lightning strokes accumulated for the years 2008–2017, presented as strokes per year per square kilometer on a 0.1° × 0.1° global grid.