

## Terms of Reference of the GCOS Task Team on Lightning Observations for Climate Applications

### Background:

Lightning observations have become operational in recent decades and the availability of increasingly longer time series unleashes the great potential of lightning as a climatological variable. Therefore, lightning has been added to the list of Essential Climate Variables (ECV) in the 2016 GCOS Implementation Plan (IP, GCOS-200)<sup>1</sup>. In order to define observation requirements and to explore how the usage of lightning data for climate applications can be promoted, the Atmospheric Observation Panel for Climate (AOPC) agreed during AOPC-22 (Exeter, UK, March 2017) on the creation of a dedicated task team on lightning observations for climate applications (TTLOCA). This task team continued the work related to lightning observations of the Task Team on the Use of Remote Sensing Data for Climate Monitoring of the Commission for Climatology (CCI) as a joint GCOS/CCI task team. TTLOCA completed its Terms of Reference (ToR, GCOS-213)<sup>2</sup>, and a report discussing challenges and general recommendations on the usage of lightning has been published (GCOS-227)<sup>3</sup>. Further initiatives like the establishment of a thunder day database and a pilot study on measuring ionospheric potential using the GCOS Reference Upper Air Network to observe global thunderstorm activity have also been launched. Based on this outcome, AOPC decided during its 25<sup>th</sup> session (videoconference, April 2020) to extend TTLOCA and charge it with continuing current relevant activities and with initiating tasks that were identified during its initial phase.

### Revised Terms of Reference:

1. Lightning data for climate applications:
  - Develop and propose a data format including metadata for lightning data for climate applications based on existing formats. It should provide sufficient information on lightning strokes to also quantify uncertainties, but not mandatorily demand individual station information so that private data providers are also able to contribute.
  - Review temporal and spatial ECV requirements if they suffice for climate applications (daily against hourly).
  - Explore funding opportunities for a research position to prepare an exemplary dataset integrating different types of data (satellite, radio frequency (RF)). The

---

<sup>1</sup> The Global Observing System for Climate: Implementation Needs. GCOS-200 (GOOS-214). Pub WMO, Geneva, 2016. [https://library.wmo.int/opac/index.php?lvl=notice\\_display&id=19838](https://library.wmo.int/opac/index.php?lvl=notice_display&id=19838).

<sup>2</sup> • Report of the first meeting of the GCOS/CCI Task Team on Lightning Observations for Climate Applications (TTLOCA-1). GCOS-213. Pub WMO, Geneva 2018, [https://library.wmo.int/index.php?lvl=notice\\_display&id=20232](https://library.wmo.int/index.php?lvl=notice_display&id=20232).

<sup>3</sup> Lightning for Climate: A Study by the Task Team on Lightning Observation for Climate Applications (TTLOCA) Of the Atmospheric Observation Panel for Climate (AOPC). GCOS-227. Pub WMO, Geneva 2019, [https://library.wmo.int/index.php?lvl=notice\\_display&id=21405](https://library.wmo.int/index.php?lvl=notice_display&id=21405).

goal is to integrate data of different spatial and temporal coverage and different sensors (RF, optical).

- Explore the possibility to establish an integrated lightning data portal in collaboration with GEO.
- Promote reprocessing of existing data in order to complement lightning data archives.

## 2. Thunder Day Database (TDD)

- Continue efforts to include the TDD to the WMO Information System (WIS) and subsequently request members to complement database.
- Explore the possibility to establish an integrated lightning database with NOAA or NASA that could also encompass the TDD.

## 3. Collaborate with GRUAN through the AOPC WG-GRUAN and the DWD hosted Lead Centre facility to hold field campaigns to measure ionospheric potential once sensors are available.

## 4. Liaise with other interested expert groups within WMO to ensure full consistency for application areas for lightning (e.g. registration of private lightning data providers at the WIS; metadata for real-time lightning applications). This includes exploring whether it is possible, in collaboration with the WMO/WHO working group, to identify more reliable numbers of lightning fatalities and injuries and whether material could be developed to support educational programs of WHO.

### Modus Operandi:

- The task team shall exist for an initial period of two years with an extension of additional two years if needed and approved by AOPC.
- The task team shall work primarily remotely, facilitated by the GCOS secretariat. If resources are available, a physical meeting will be organized potentially in 2021 to prepare a detailed work plan and introduce new members.
- Current membership has been extended and additional members to fulfil new tasks can be nominated by the Chair of TTLOCA and need approval by the chair(s) of AOPC.
- Robert Holzworth has been nominated as chair for the second phase of TTLOCA.

### References

- The Global Observing System for Climate: Implementation Needs. GCOS-200 (GOOS-214). Pub WMO, Geneva, 2016, [https://library.wmo.int/opac/index.php?lvl=notice\\_display&id=19838](https://library.wmo.int/opac/index.php?lvl=notice_display&id=19838).
- Report of the first meeting of the GCOS/CCI Task Team on Lightning Observations for Climate Applications (TTLOCA-1). GCOS-213. Pub WMO, Geneva 2018, [https://library.wmo.int/index.php?lvl=notice\\_display&id=20232](https://library.wmo.int/index.php?lvl=notice_display&id=20232).
- 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). GCOS-227. Pub WMO, Geneva 2019, [https://library.wmo.int/index.php?lvl=notice\\_display&id=21405](https://library.wmo.int/index.php?lvl=notice_display&id=21405).