World Climate Research Programme
c/o World Meteorological Organization
7 bis, avenue de la Paix
Case postale N° 2300
CH-1211 Geneva 2 – Switzerland
wcrp@wmo.int

JSC-44
Submitted by: Name
Date
DRAFT OR FINAL?

Request of input from core activities to the

44th Session of the WCRP Joint Scientific Committee (JSC)

8-11 May 2023

Report to the WCRP Joint Scientific Committee

Digital Earths Lighthouse Activity

1. Highlights achieved since JSC-43

- *WCRP km-scale modeling workshop (Boulder, CO, USA, 3-7 October 2022):* this workshop was organised in collaboration with ESMO. A report has been published (https://www.wcrp-climate.org/WCRP-publications/2022/WCRP_Report_08-2022_k-scale-report-final.pdf). It brought together researchers from the Earth system communities – land, atmosphere, ice, and ocean – and researchers working on different scales – regional to global, weather to climate. The extensive breakout discussions covered critical scientific questions and key technical challenges for k-scale models. Several recommendations have been made related to scientific and technical issues. Process Intercomparison Projects (PIPs) and coordinating meetings of relevant model development groups across spheres will be organised in 2023 and 2024.
- *Outreach:* we have been conducting extensive outreach to develop the lighthouse activity further. This includes numerous discussions and presentations, ranging from longer format lectures/webinars to programmatic presentations to different groups noted below. These follow some of the key aspects of developing the lighthouse activity, including interactions with regional modelling groups (CORDEX), process focused activities (GEWEX) and modelling steering committees and organizing groups (WGCM, WGNE, US Modelling Summit, USCLIVAR).
    - US regional hydroclimate planning
    - CORDEX/EUROCORDEX
    - GEWEX
    - USCLIVAR Webinar
    - USCLIVAR SSG
    - WGCM-WGNE
    - US Climate Modelling Summit

- *Coordination Efforts*: The Digital Earth (DE) Lighthouse Activity (LHA) has started a series of discussion groups aimed at (1) improving communication and building communities and (2) advancing science for Digital Earth systems and high-resolution km-scale models. This is happening with grassroots organized groups of scientists focused on topics identified in the workshop. It is encouraged that the discussions lead to a product: either an assessment or review paper, or perhaps a catalogue of current and planned efforts/data/methods. One key is that these groups can include both model developers, those analysing models as well as scientists taking observations. Models can be regional or global at high resolution. Key topics include*:*
    - Process comparisons across models for convective organization, land atmosphere coupling, and possibly other topics through a general seminar series.
    - A catalogue of high-resolution input data sets
    - A list or catalogue of analysis tools and workflows
    - A sub-group on urban digital twins
    - A discussion of initialization and spin up of high resolution coupled models.

- We have identified a preliminary list of km-scale model groups that we are communicating with. 21 different efforts identified, 12 global, 9 regional. About ⅔ of these groups attended meetings in person or virtually. They are not all in developed countries, and a few efforts are in the global south. See figure 1.

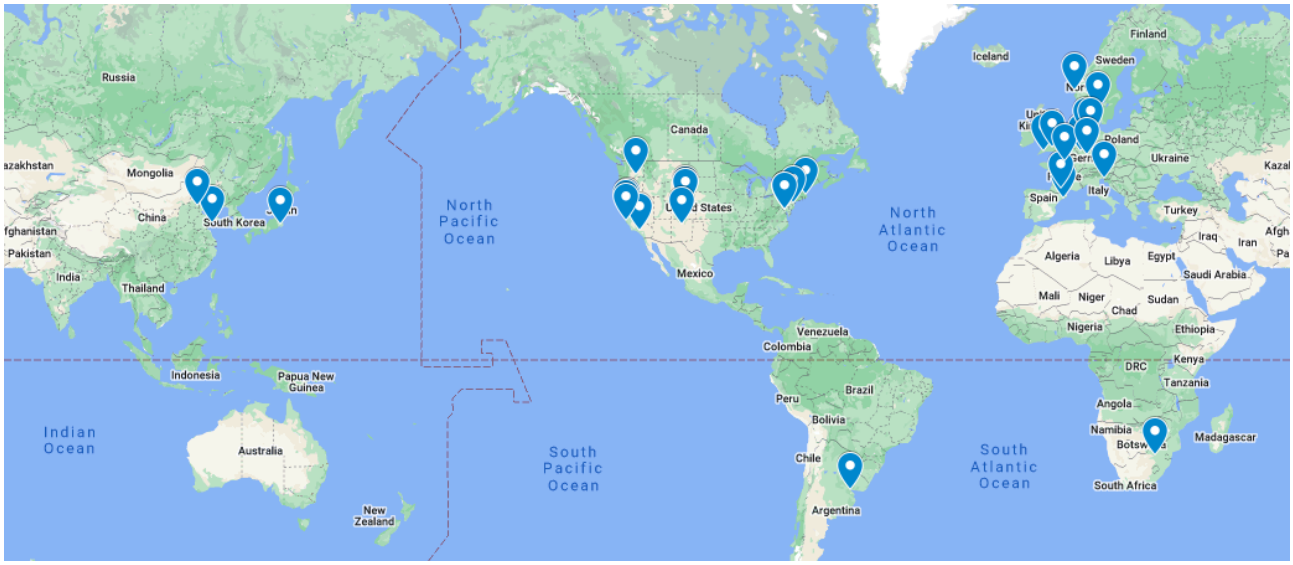

Figure 1: Map of km-scale model development groups

- Km-Scale model development working group: Issues with km-scale coupled models are slightly particular and fall between WGCM and WGNE. After consultation with WGCM and WGNE during their annual meetings, we identified the need for a group that regularly meets and discusses k-scale resolution model development specifically. The group should be joint effort between the Digital Earth LHA, WGNE and WGCM.

2. Planned science initiatives and major events *(next 3 to 5 years)*

- *The Digital Earth LHA is proposing to nurture the grass roots coordination groups discussed above to advance high resolution coupled modelling activities and build communities. A key aspect of this is bringing regional and global models together.*
- *We are discussing a coordinated meeting of different high resolution modelling efforts in 2024, with different 'spheres' present, and possibly regional and global groups.*
- *Launch the new k-scale group with WGNE and WGCM in 2023/2024*
- *A hackathon/tutorial is planned for 2024 as well.*
- *In the next year, based on the result of additional workshops (June, MIT), we intend to 're-launch' the DA for climate efforts, and to start further discussions of key areas 'beyond the digital system'.*
- *The Digital Earth LHA will continue to be a conduit and platform for ongoing discussions and development.*

3. Active or planed collaborations with other Core Projects, Lighthouse Activities etc.

- *Planned strong collaboration with ESMO on km-scale modelling activities (Joint development group with WGCM and WGNE)*
- *Collaborations with GEWEX on processes: GASS and GLASS*
- *Working with CORDEX/EUROCORDEX*

3a. Requests for the WCRP Academy to support your training activities?

- *As we start to think about 2024 meetings, we will coordinate/collaborate with the WCRP academy.*

4. Partnerships with projects outside WCRP

- *Ongoing discussions with different modelling groups*
- *Conversations with ISIMIP*
- *Contributions to development of a US Regional Hydroclimate Project as a 'digital earth' development*

***5. Issues and challenges**:*

- Identification of a new co-chair (agreed on candidate, proposing JSC)
- Evolution into a more regular and formal management structure, update Activity Steering Group. Discussion of the structure of the LHA and its interfaces would be useful
    - Intend to have a more regular DE LHA SSG meeting schedule (Quarterly) in the next year.
- Need to develop clear TORs for the k-scale model representatives' group with WGCM and WGNE and try to get that going.