

H. KIM LAB.

Climate system and Hydrology

Department of Human and Social Systems



Global Water Cycle System

Department of Civil Engineering, Graduate School of Engineering

<http://hydro.iis.u-tokyo.ac.jp/indexJ.html>

Meta-Earth Experiments

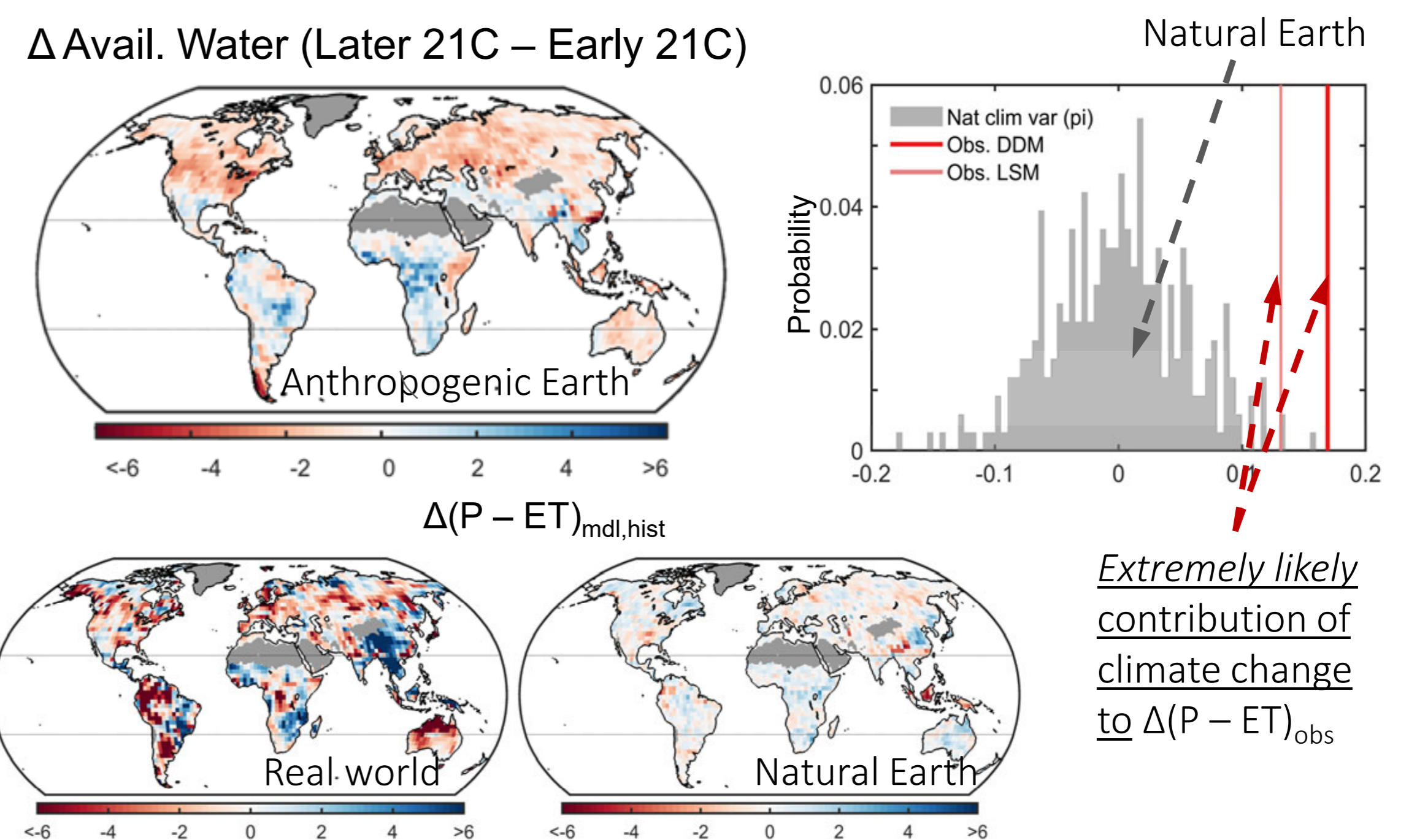
Anthropogenic Earth

Natural Earth

By comparing two different representations of virtual space, one with humanity and one without, it is possible to differentiate the effects of human-induced global warming on global energy and water cycles and their extremes. Due to the inherent randomness of the system, a large ensemble experiment is necessary to distinguish the signal from the noise.

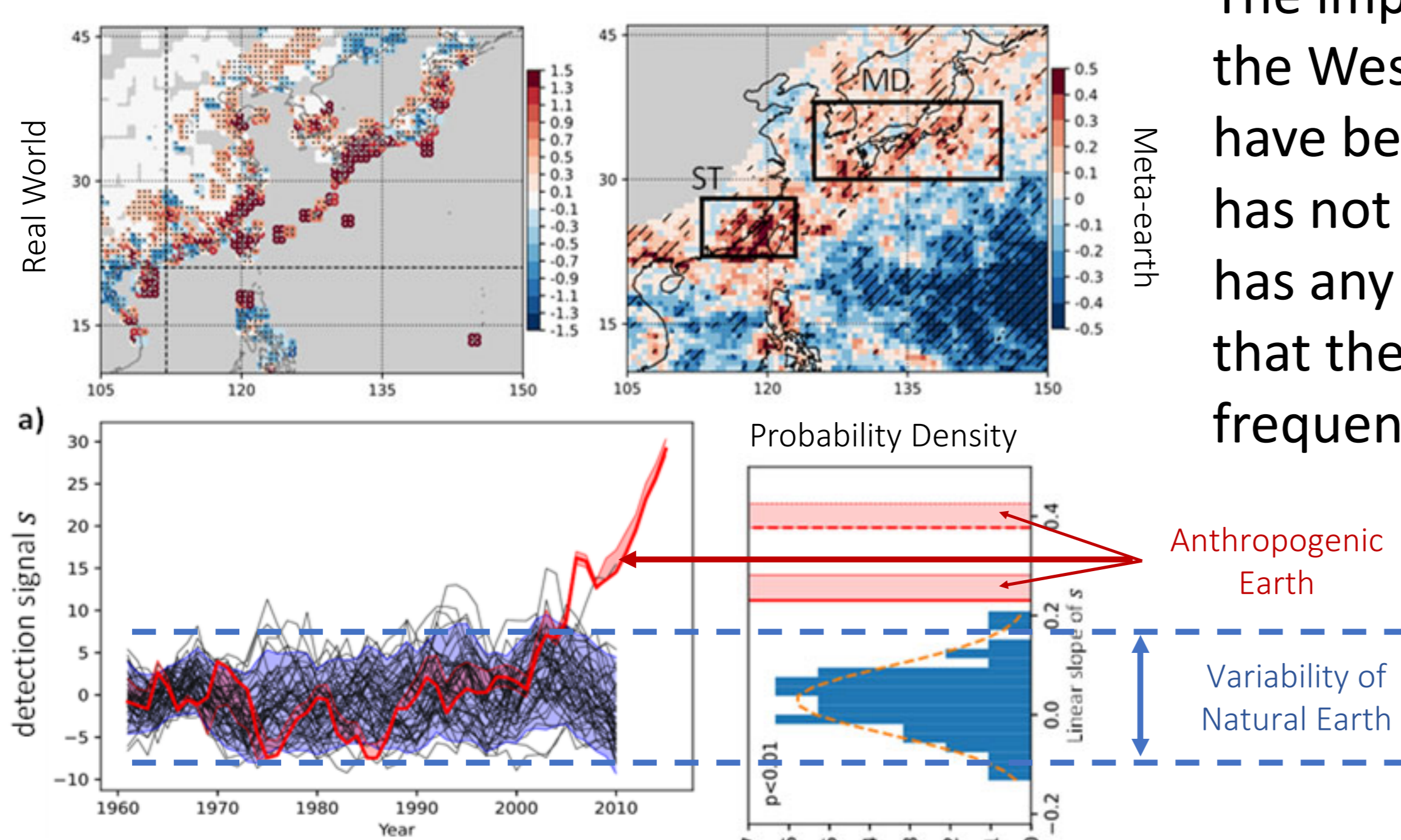
How much are we directly and indirectly affecting global water resources and droughts?

Human-induced climate change impacts the availability of water resources. However, previous assessments of observed warming-induced changes in dryness have not excluded natural climate variability. Our experiment reveals a spatial pattern of changes in average water availability which is consistent with climate model estimates that account for anthropogenic effects, and it is not expected from natural climate variability, supporting human-induced climate change as the cause. It has been found that the intensification of the dry season is generally a consequence of increasing evapotranspiration rather than decreasing precipitation.



Does global warming make typhoon heavy rainfall more frequent?

Δ freq. of typhoon heavy rain (once-in-10year since 1961)



The impact of climate change on typhoon is of great concern in the Western North Pacific region. Observations suggest there have been recent changes in typhoon heavy rainfall. However, it has not yet been determined whether anthropogenic forcing has any contribution to such changes. Here, we show evidence that the human-induced warming has considerably changed the frequency of TC-induced heavy rainfall events in the region.

Based on Meta-Earth experiment, we demonstrate the observed changes cannot be explained solely by natural variability. This suggests that anthropogenic impacts have already significantly altered the TC-induced heavy rainfall pattern in the WNP region.

