

HyARC Seminar (HyARC Seminar#180)

Date: April 7 (Tuesday) 13:30-

Room: The meeting room (#617) of Research Institutes Building.

Speaker: Prof. Cheng-Ta Chen

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Title: Assessing Possible Anthropogenic Contributions to the Rainfall Extremes Associated with Typhoon Morakot (2009)

Abstract:

More than 2000 mm rainfall occurred over southern Taiwan when a category 1 Typhoon Morakot passed through Taiwan in early August 2009. Entire village and hundred of people were buried by massive mudslides induced by record-breaking precipitation. Whether the past anthropogenic warming played a significant role in such extreme event remained very controversial. On one hand, people argue it's nearly impossible to attribute an individual extreme event to global warming. On the other hand, the increase of heavy rainfall is consistent with the expected effects of climate change on tropical cyclone. To diagnose possible anthropogenic contributions to the odds of such heavy rainfall associated with Typhoon Morakot, we adapt an existing event attribution framework of modeling a "world that was" and comparing it to a modeled "world that might have been" but in the absence of historical anthropogenic drivers of climate. One limitation for applying such approach to high-impact weather system is that it requires models capable of capturing the essential processes lead to the studied extremes. Using a cloud system resolving model that can properly simulate the complicated interactions between tropical cyclone, large-scale background, topography, we first perform the ensemble "world that was" simulations using high resolution ECMWF YOTC analysis.

We then re-simulate the case by adjusting the analysis to "world that might have been conditions" estimated by removing the regional atmospheric and oceanic forcing due to human influences estimated from the CMIP5 model ensemble mean conditions between all forcing and natural forcing only historical runs. Thus our findings are highly conditional on the driving analysis and adjustments therein, but the setup allows us to elucidate objectively possible contribution of anthropogenic forcing to changes in the likelihood of heavy rainfall associated Typhoon Morakot in early August 2009.

(given in English)