

113 年度自然處專題計畫主持人近五年研究成果

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一、請簡述近五年代表性研究成果(含儀器或關鍵技術開發等實務應用面向)之個人重要貢獻 (至多一頁)。

Hydrological Extreme from prediction to projection:

- (a) Exploring the subseasonal/seasonal predictability of North America atmospheric rivers and developing a prototype seasonal forecast product.
- (b) Improve the existing framework of detection-and-attribution (fingerprint method by Hasselmen 1992) method and provide an analytical solution for quantifying the time of signal emergence in color-noised variables.
- (c) Explore the potential change in snow-drought and atmospheric river compound events. The study provides guidance for policy decision making.

Next-generation probabilistic forecast method with information theory:

- (a) Propose a new framework of ensemble forecast using data-driven Liouville equation (statistical mechanics)
- (b) Extend the proposed method in (a) to subseasonal forecast problem and connect it with the moisture mode framework. Integrating “monitoring”, “forecast” and “theory” in one single framework.
- (c) Extend the proposed framework to higher dimension problem and non-Gaussian statistics, which provides a more general definition of predictability.

Large-scale tropical/extratropical dynamics and the predictability:

- (a) Using GFDL spectral shallow water model, tropical wave theory and energetic framework to explore the mechanisms responsible for late and early monsoon onset in South Asia.
- (b) Using GFDL spectral model to bridge the knowledge gap in annular mode study. Found that incorporating the influence from the tropics can potentially reduce the persistence of annular mode.

二、近五年內(2019/1/1 ~ 2023/12/31)已出版之最具代表性研究成果至多6篇, 擇其中5篇電子檔上傳。(請依序填寫: 姓名,著作名稱,發表年份,期刊,卷數,頁次, 並以 * 號註記該篇所有的通訊作者)

(1-6)

1. K.-C. Tseng*, Y.-H. Ho, The subseasonal predictability of the western North Pacific subtropical high

and the 2020 record-breaking event. *Npj Clim. Atmos. Sci.* **7** (2024).

2. J. Schmitt*, K.-C. Tseng, M. Hughes, N. C. Johnson, Illuminating snow droughts: The future of Western United States snowpack in the SPEAR large ensemble. *J. Geophys. Res.* **129**, e2023JD039754 (2024).
3. C. Bowers*, K. A. Serafin, K.-C. Tseng, J. W. Baker, Atmospheric river sequences as indicators of hydrologic hazard in historical reanalysis and GFDL SPEAR future climate projections. *Earths Future* **11** (2023).
4. B. Jong*, T. Delworth, W. Cooke, K. Tseng, H. Murakami, Increases in extreme precipitation over the Northeast United States using high-resolution climate model simulations. *Npj Clim. Atmos. Sci.* **6**, 1–9 (2023).
5. K.-C. Tseng*, N. C. Johnson, S. B. Kapnick, W. Cooke, T. L. Delworth, L. Jia, F. Lu, C. McHugh, H. Murakami, A. J. Rosati, A. T. Wittenberg, X. Yang, F. Zeng, L. Zhang, When will humanity notice its influence on atmospheric rivers? *J. Geophys. Res.* **127** (2022).
6. K.-C. Tseng*, N. C. Johnson, S. B. Kapnick, T. L. Delworth, F. Lu, W. Cooke, A. T. Wittenberg, A. J. Rosati, L. Zhang, C. McHugh, X. Yang, M. Harrison, F. Zeng, G. Zhang, H. Murakami, M. Bushuk, L. Jia, Are multiseasonal forecasts of atmospheric rivers possible? *Geophys. Res. Lett.* **48** (2021).

三、近五年內獲獎情形及重要會議邀請演講至多5項。

獲獎:

2023 國科會 2030 新秀學者計畫

2022 教育部玉山青年學者

會議邀請

2024 July Seminar at Division of Seasonal to Decadal Prediction, Geophysical Fluid Dynamics Laboratory, NOAA (Princeton, NJ, USA)

2022 July USCMS workshop and summit meeting at Washington D.C. (The highest rank of US modeling center meeting, invited speakers including scientists from GFDL, NCAR, PNNL...)

2022 April International Research Institute for Climate and Society (IRI, Columbia University) formal seminar.

2022 Jan AMS annual meeting

2021 WWRP/WCRP/S2S/MJO teleconnection webinar

四、近五年內其他資料: 擔任國際重要學術學會理監事、國際知名學術期刊編輯或評審委員等。

Journal Reviewer: Nature Climate Change, Nature Geoscience, Communications Earth and Environment (Nature), Journal of Climate, npj Climate and Atmospheric Science (Nature), Geophysical Research Letter, JGR-Atmosphere, Climate Dynamics, Advanced in Atmospheric Sciences, Monthly

Proposal Reviewer: National Science Foundation, 國科會, GFDL internal review

五、研發成果智慧財產權及其應用績效：

1.專利：請填入近五年內核准之有效專利。「類別」請填入代碼：(A)發明專利(B)新型專利(C)新式樣專利。

類別	專利名稱	國別	專利號碼	發明人	專利權人	專利核准日期	國家科學及技術委員會計畫編號

2.技術移轉：(近五年內完成簽約者)

技術名稱	專利名稱	授權單位	被授權單位	簽約日期	權利金,衍生利益金等	國家科學及技術委員會計畫編號

3.獲選本會「未來科技展」參展之技術：

技術名稱	參展年度	國家科學及技術委員會計畫編號