中尺度暨地形降水研究室
Mesoscale and Orographic Precipitation Laboratory

- **研究室簡介：**(網址：http://mopl.as.ntu.edu.tw/web/)

本研究室為游政谷教授所指導，主要研究領域涵蓋了地形降水機制、中緯度與熱帶對流系統動力、局部環流與降水、台灣劇烈天氣與中尺度天氣現象。現階段的研究重心為利用雷達觀測來探討颱風環境下地形降水的物理過程、颱風雨帶結構以及地形效應與局部環流所引發的對流降水。

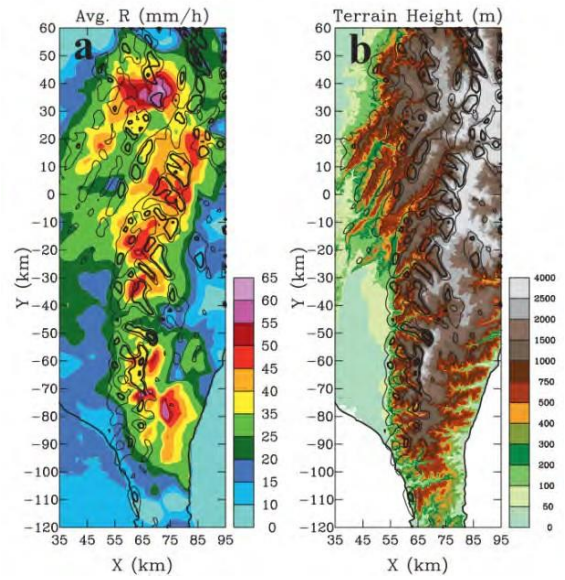
- **指導教授：** 游政谷 教授 Prof. Cheng-Ku Yu

研究專長：
地形降水、
劇烈天氣與中小尺度天氣現象、
颱風(鋒面)雨帶結構與動力

- **目前研究室成員：**10人(包含：博士後研究員、博士生、碩士生、研究助理)
- **研究成果展示：**

Orographic Precipitation

Understanding of this subject is particularly desirable for a better forecasting of heavy rainfall over the mountainous regions such as Taiwan. To approach this issue, three distinct flow regimes/characteristics will be addressed. First is that the lower troposphere is characterized by convectively unstable environment and relatively low Froude number flow regimes. This part of research will focus on analyses of precipitation systems occurring during the Mei-yu and warm season of Taiwan. Second is that the lower troposphere is characterized by rather large Froude number flow regimes. In this part of research, analyses of precipitation events occurring in the typhoon environment will be focused. Third is that the lower troposphere is generally characterized by convectively stable environment and moderate-to-small Froude number flow regimes. In this part of research, we focus on the study of mountainous precipitation systems occurring during the wintertime in Taiwan.

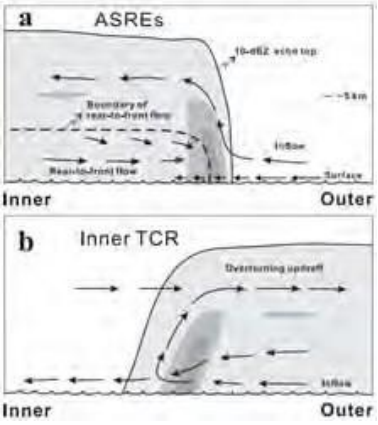


左圖為針對 2009 年莫拉克颱風之臺灣西南部山區豪雨進行詳細的地形降水特性分析。研究發現，在颱風環境下，較寬較高山脈之地形降水乃由地形上坡抬升所加強，但較窄較低山脈之地形降水是由種雲播雲機制所加強。這是首次由觀測資料證明在颱風環境下此微物理機制之重要性。

取自 Yu and Cheng, 2013, *J. Atmos. Sci.*

Structure and Dynamics of Typhoon Rainbands

The primary objective of this part of the research is to use temporal high-resolution surface observations, whole-island Doppler radar observing network and micro rain radar to identify a significant number of typhoon rainbands near Taiwan and to investigate dynamical and thermodynamic structures of TCRs and their associated near-surface features. Particular attempt is to understand the main features and possible diversity of TCRs and to improve our knowledge of the interaction between TCRs and topography. Some specially chosen cases of typhoon rainbands will also be studied in detail, further exploring the dynamical processes active within TCRs.

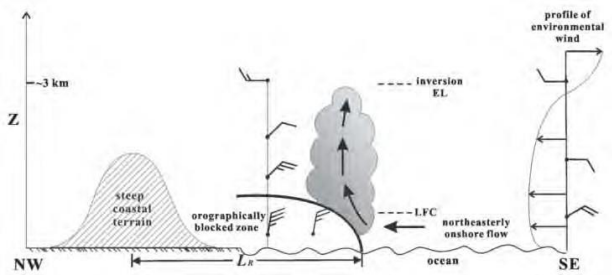


左圖為利用地面雙都卜勒雷達觀測，分析 2005 年龍王颱風弓狀回波的三維結構特徵(a)。研究成果發現，颱風雨帶弓狀回波的運動場結構與颱線的對流區域相似，但與位在接近颱風內核的雨帶有顯著差異(b)。

取自 Yu and Tsai, 2013, *J. Atmos. Sci.*

Diurnally and Topographically Forced Circulations and Precipitation

Taiwan is a mountainous island, with extremely steep and high terrain. Under weakly synoptic weather conditions, development of moist convection is usually related closely to coastal land/sea breezes and circulations induced thermally and/or dynamically by topography. Deep convection and/or severe precipitation occurring in this particular geographical location are one of the most frequent mesoscale phenomena. Documentation of these convective weather systems can provide an excellent opportunity to explore our general understanding of physical processes leading to the formation and development of moist convection in the vicinity of a mountainous island.



左圖為針對臺灣東南方沿岸外海對流線進行個案研究，透過詳盡的分析及診斷，提出一概念模式來具體說明其生成機制及可能伴隨的物理過程。

取自 Yu and Heish, 2009, *Mon. Wea. Rev.*

- **野外觀測實驗：**