



Concentric Eyewall Structure of Typhoon Bolaven (2012)

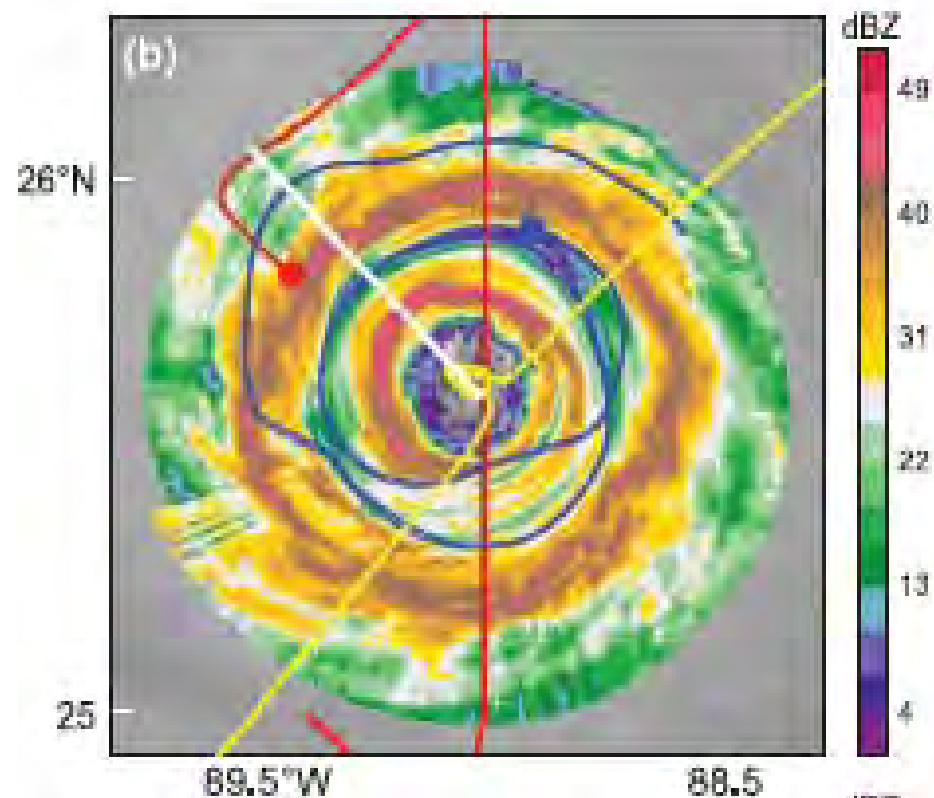
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第3回超高精度メソスケール気象予測研究会

Introduction

- Tropical cyclone has concentric, multiple eyewalls.



Radar reflectivity @Hurricane Rita, 2005.
(Houze et al., 2007)

Introduction

- 多重壁雲は熱帯低気圧の強度（風速・気圧）に影響。
 - Eyewall Replacement.
 - Rita (2005) の場合には, 外側の壁雲形成から内側消失まで 12 hour 程度 (e.g. Houze et al., 2007).
- 数値モデルによる再現。
 - 多重壁雲構造の再現は水平 1 km 程度の解像度が必要 (e.g. Houze, 2010).

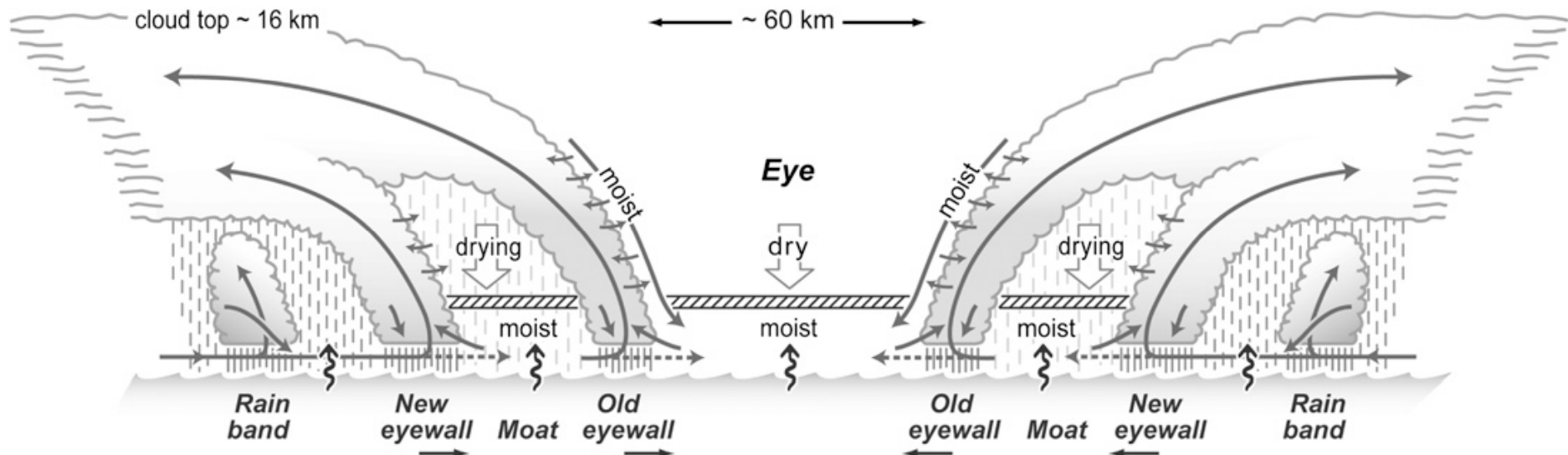
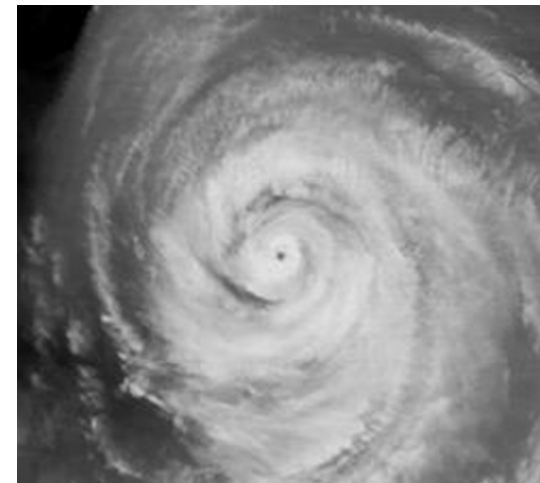


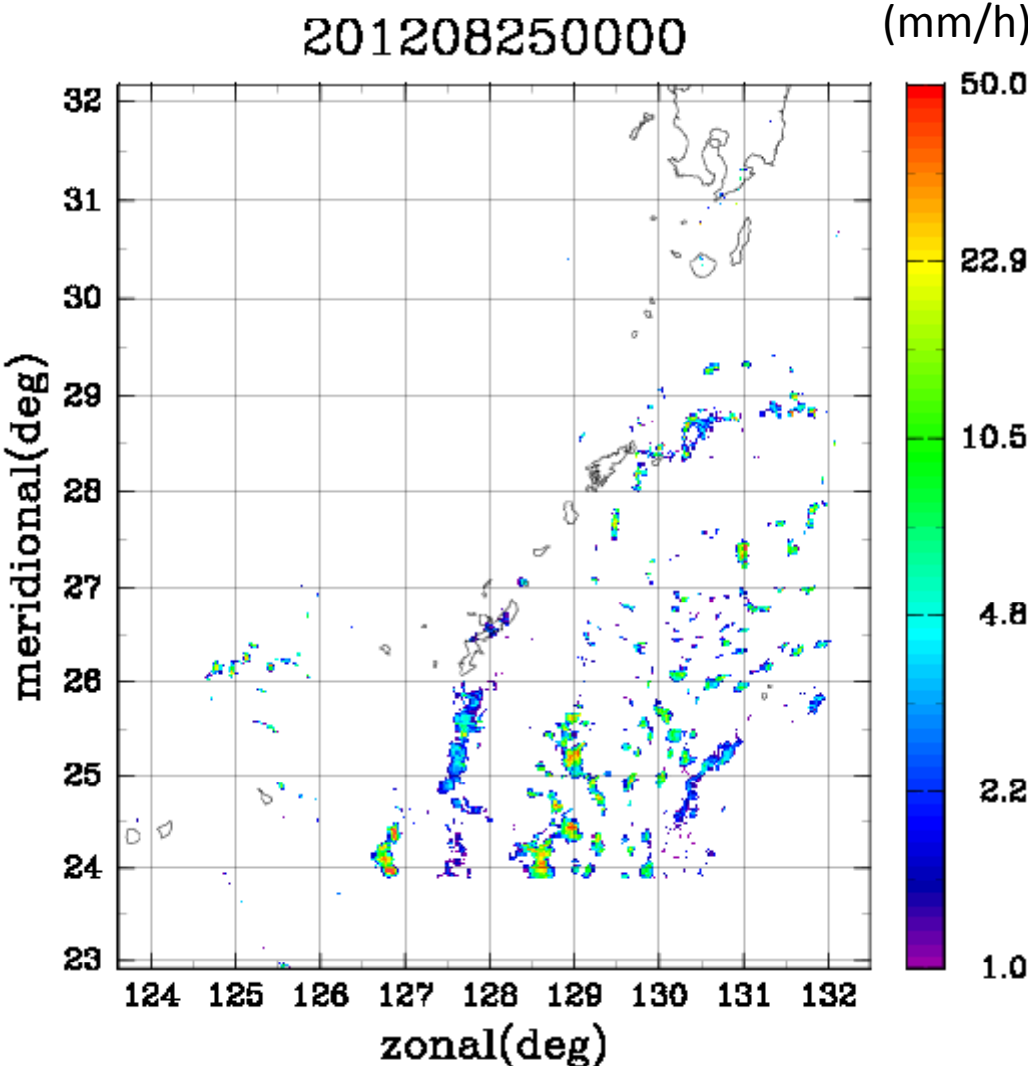
Illustration of concentric eyewalls (Houze et al., 2007).

Introduction

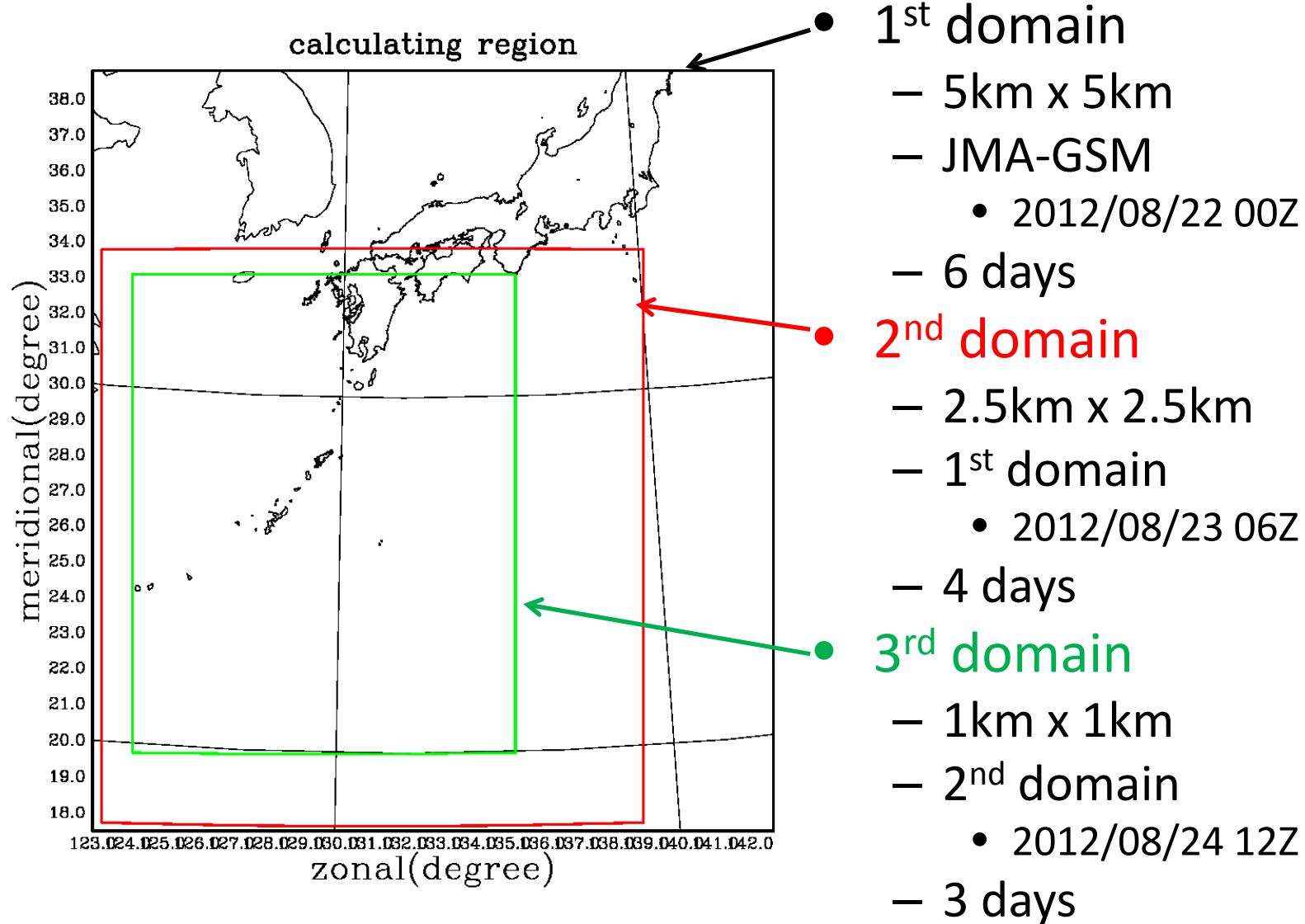
- Typhoon Bolaven (2012)
 - Multiple eyewall structure.
 - Maintaining the structure over 24 hour.
- We conduct simulation of Bolaven, using three-dimensional, non-hydrostatic model (CReSS).
 - High resolution (1km x 1km).



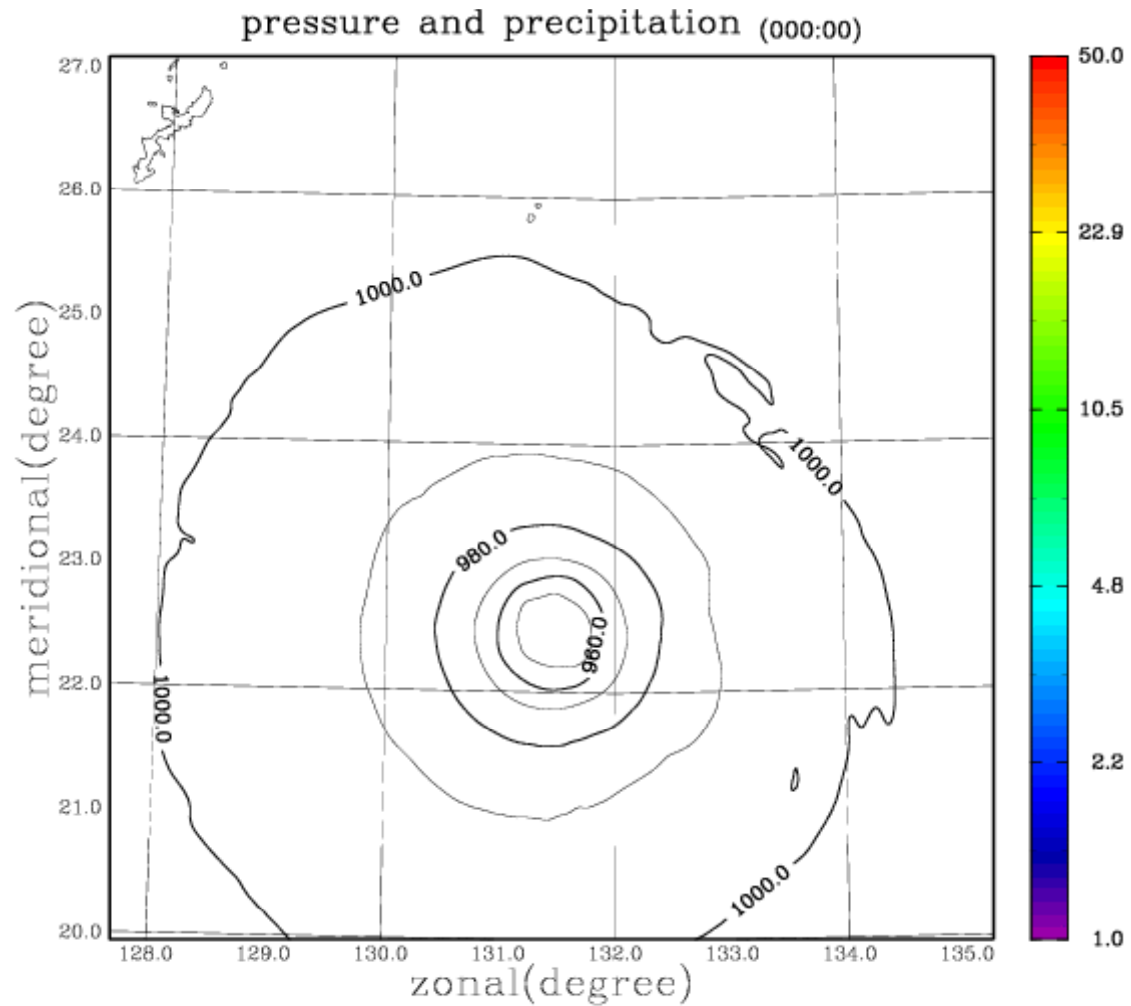
Observation (Doppler Radar)



Domain and Initial condition

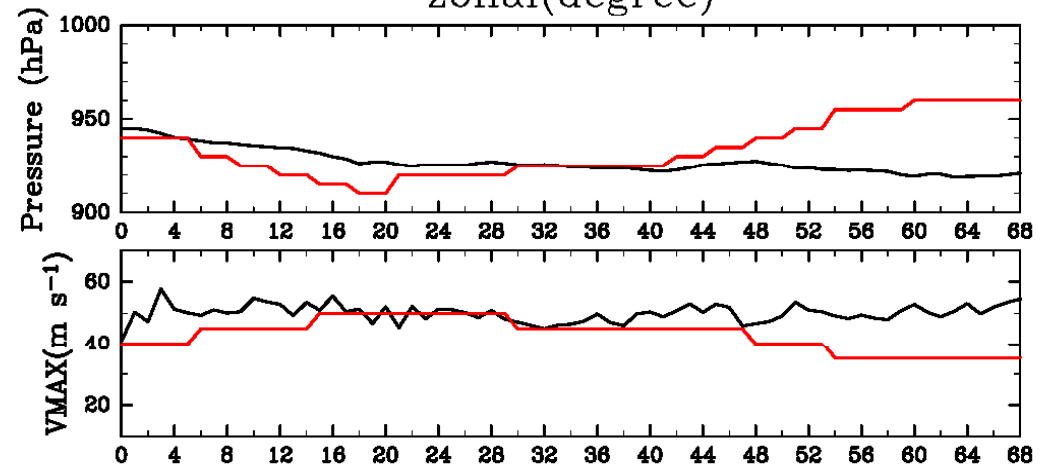
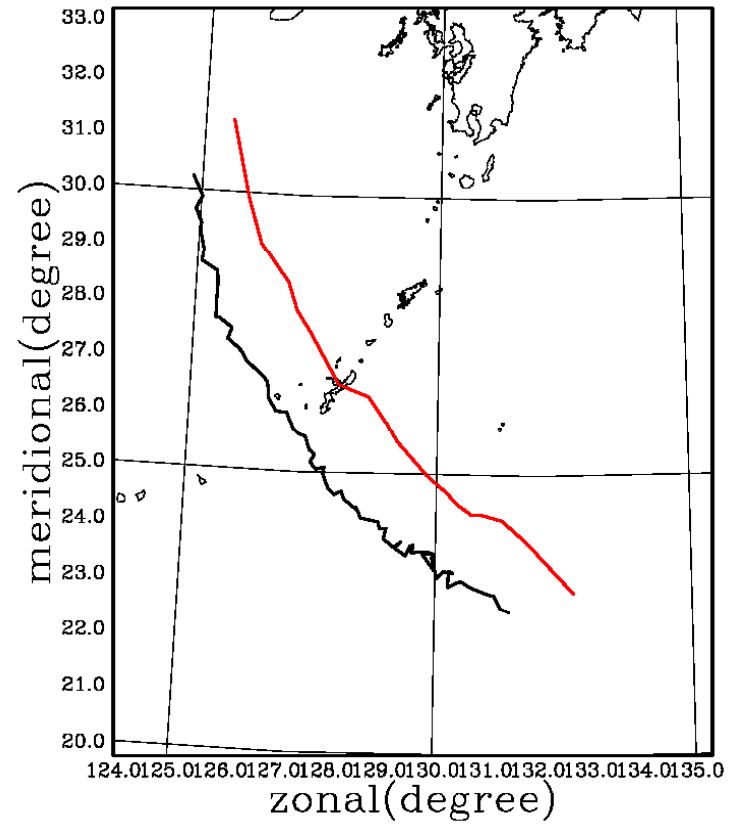


Results(3rd domain)



Obs. v.s. Sim.

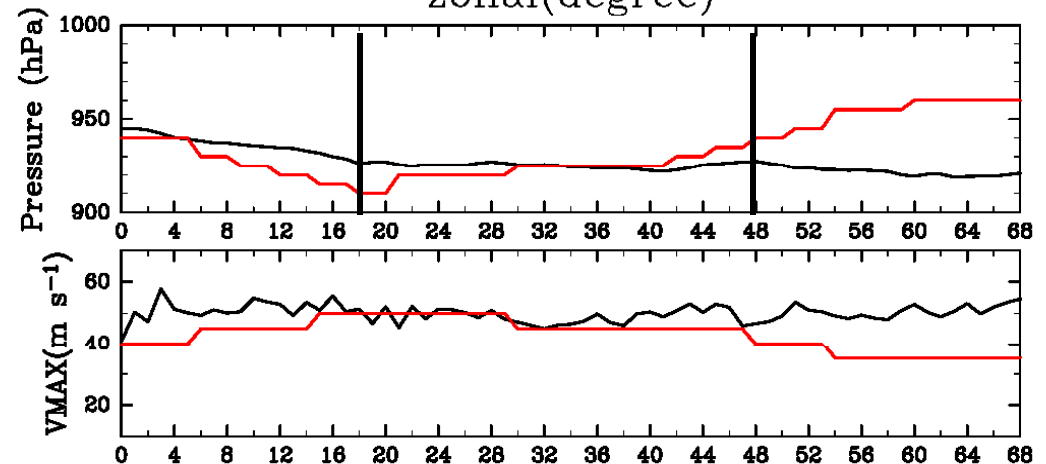
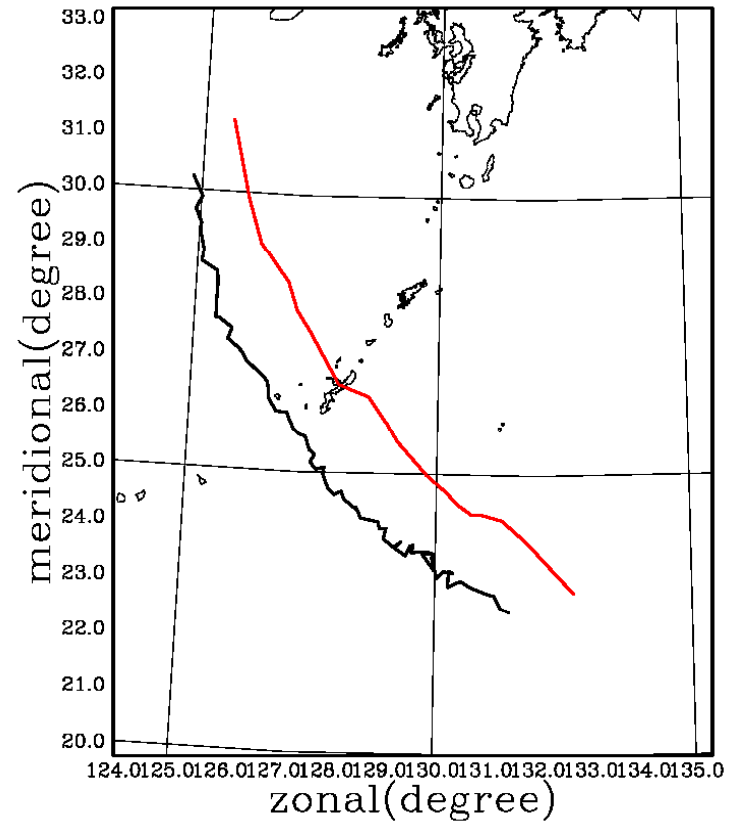
pressure and precipitation(t= 68.0[h])



Obs. v.s. Sim.

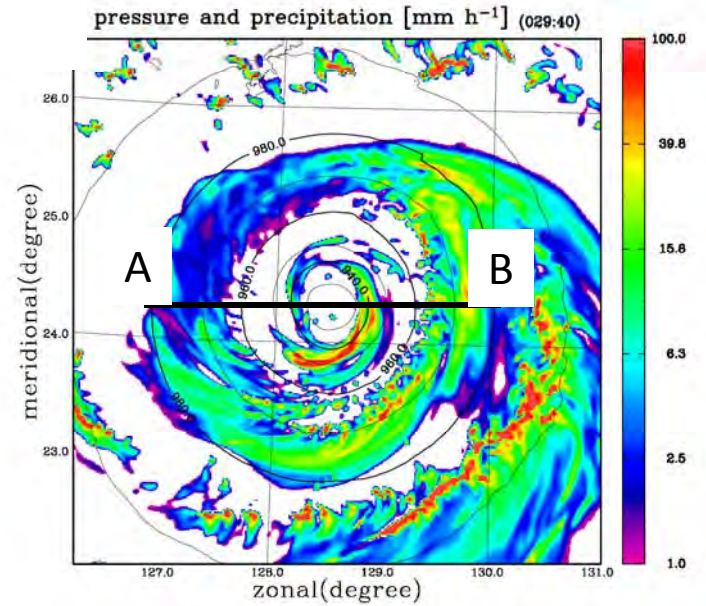
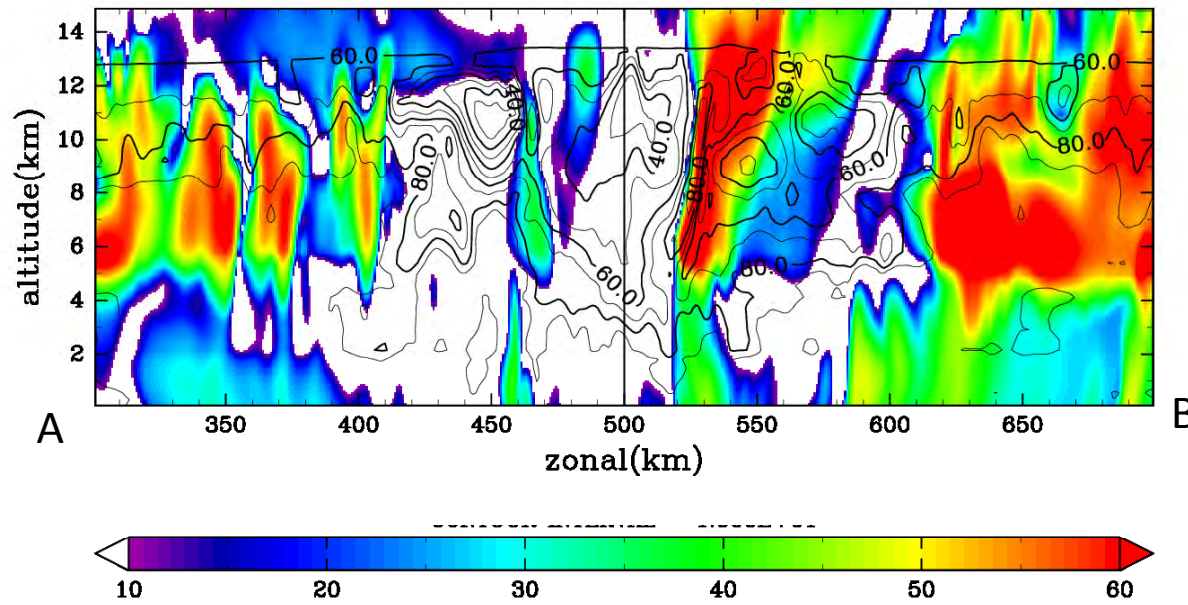
- 中心位置
 - 2-5° ずれ.
 - 1st domain によるもの.
- 中心気圧
 - 最低値は 20 hPa 程度大きい.
 - 48 hour 以降, 衰退しない.
- 最大風速
 - 48 hour まで, おおむね一致.

pressure and precipitation(t= 68.0[h])



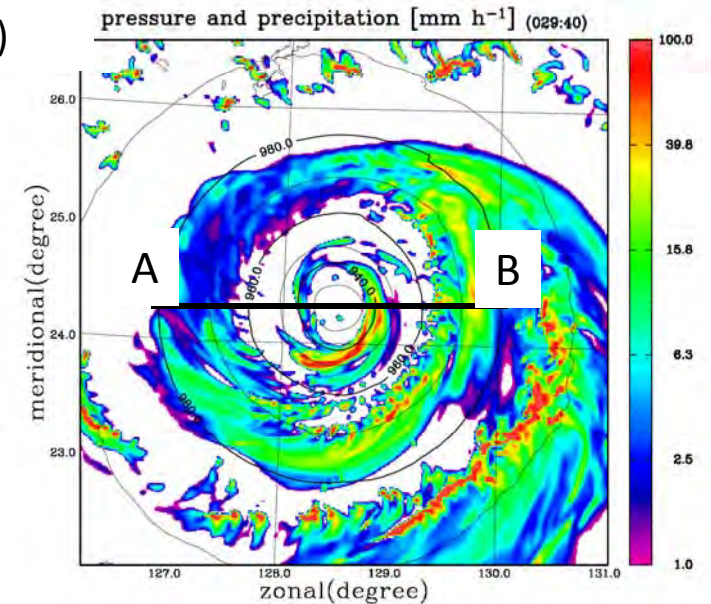
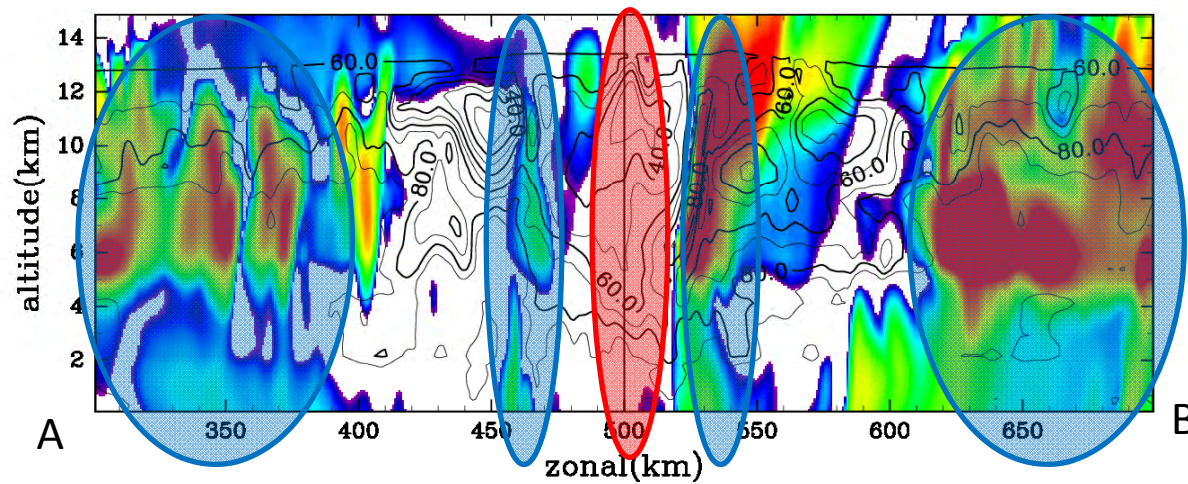
Vertical Structure

Relative Humidity (contour) and simulated radar reflectivity (color)



Vertical Structure

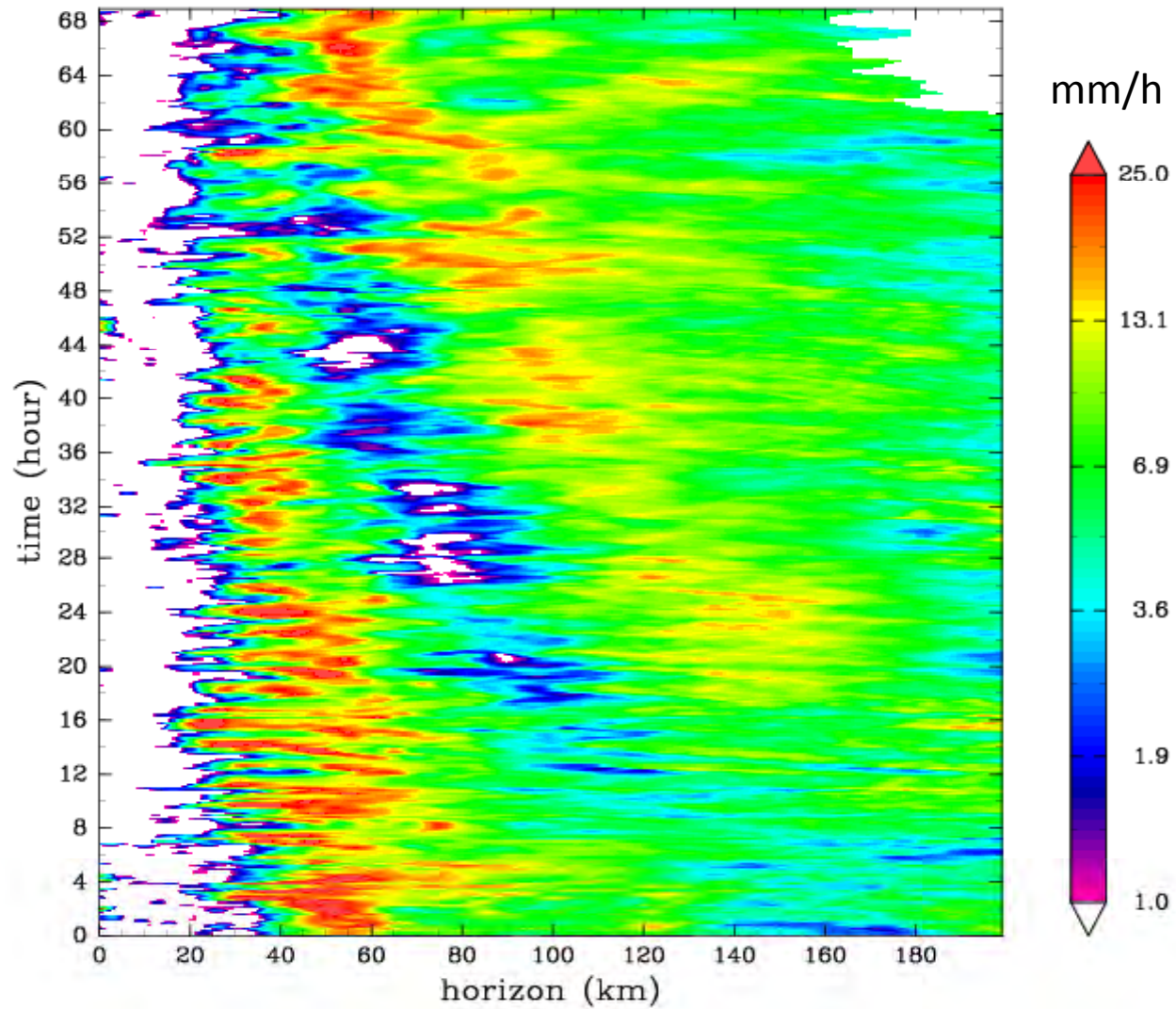
Relative Humidity (contour) and simulated radar reflectivity (color)



- 半径 30 km 程度の eye から順に, 内側壁雲, 外側壁雲が形成.
- 内側の壁雲は 1 つ.

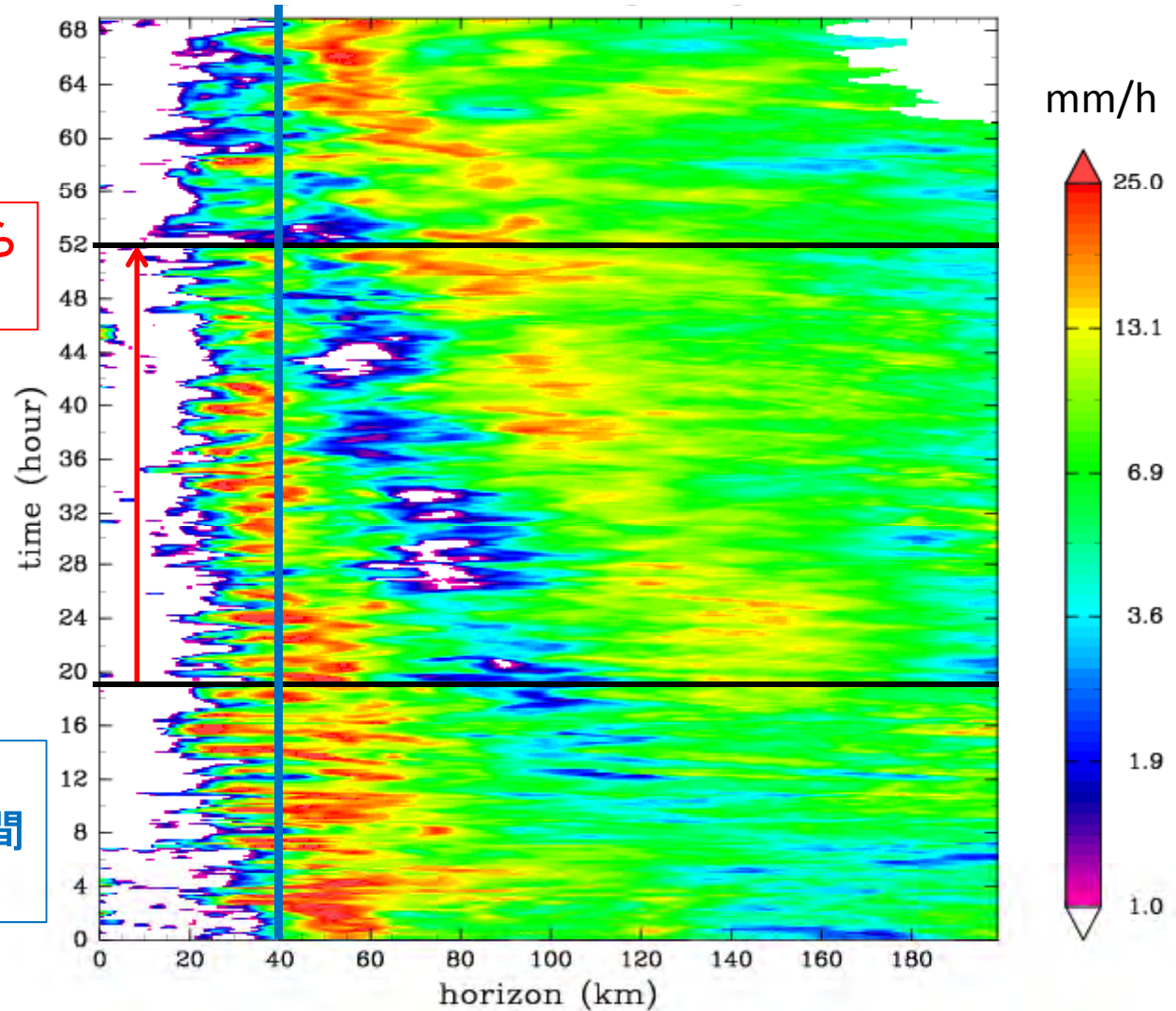
Time series of concentric eyewalls

Tangential mean precipitation



Time series of concentric eyewalls

Tangential mean precipitation



外側壁雲が形成されてから
およそ 24 hour 以上維持.

内側の壁雲は観測された
壁雲の 1 つめと 2 つめの間
付近に形成.

Summary

- 3次元非静力学モデル CReSS を用いて, 2012年 15号台風 (Bolaven) の高解像度再現計算を行った.
- Bolaven の多重壁雲構造
 - 壁雲は内側と外側の2つのみ再現.
 - 形成されてから 24 hour 以上維持.