地表粗糙度對模式預報效能之影響

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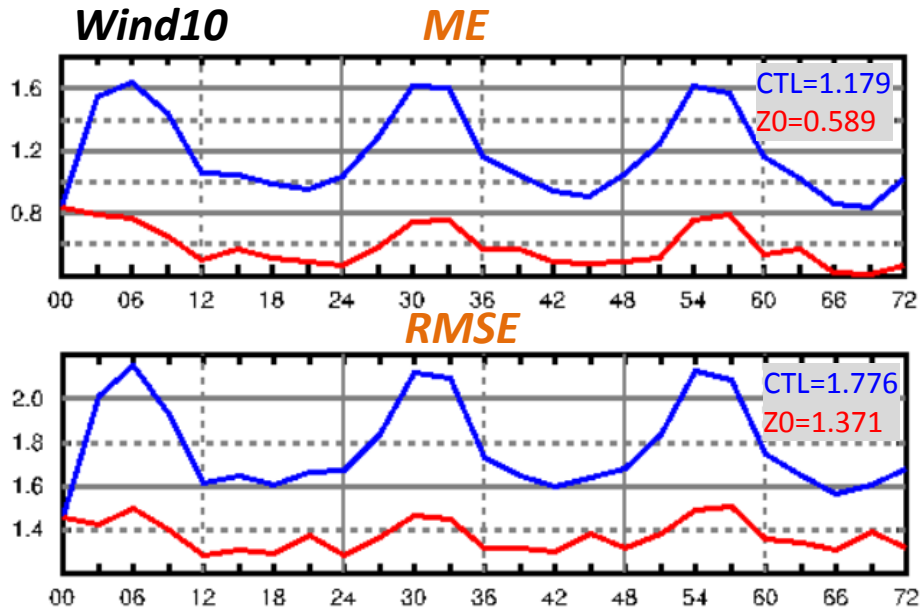
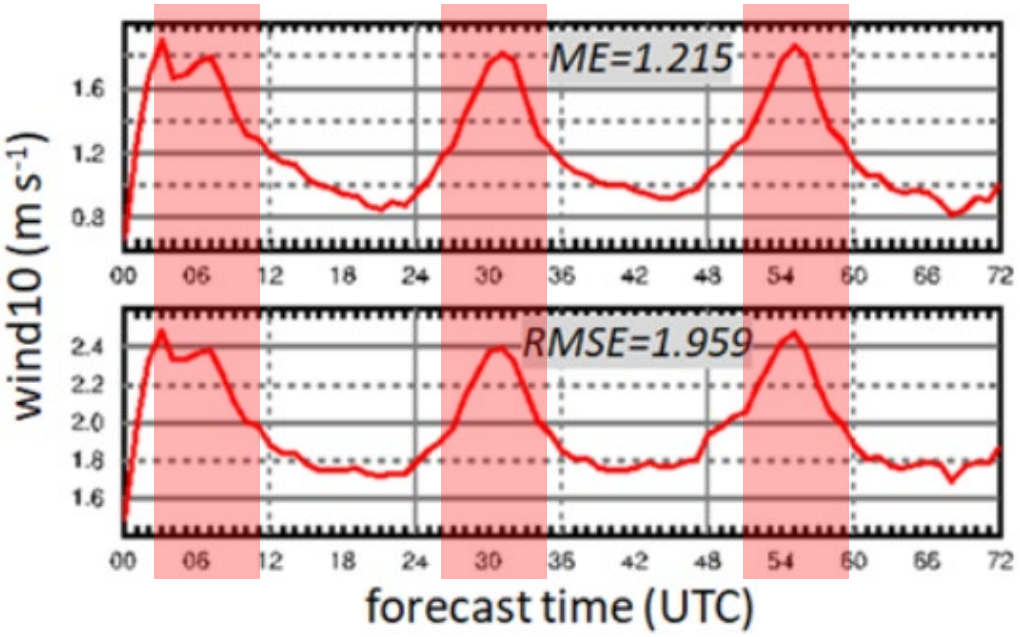
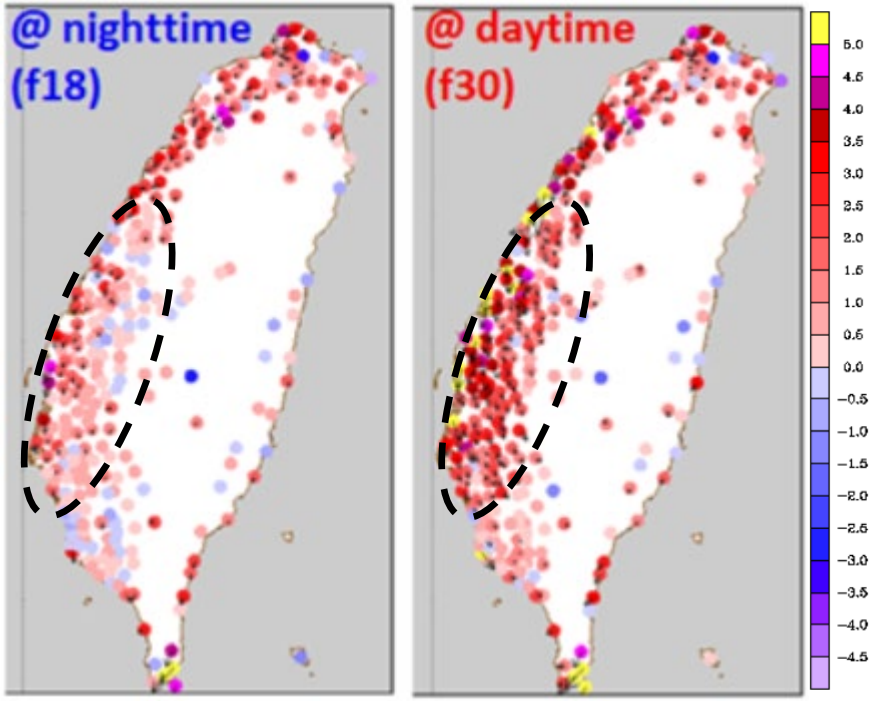
108年天氣分析與預報研討會
2019/05/14 ~ 05/15 @ 台北



Motivation

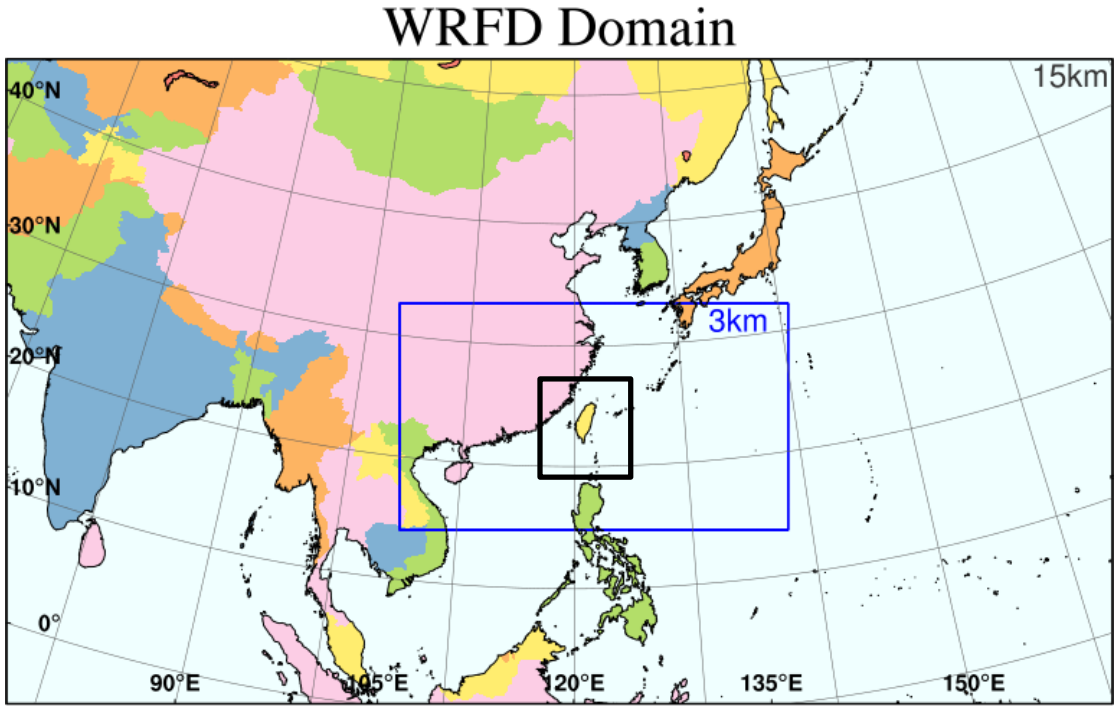
10 m wind verified during 2017/12/01 ~ 12/31





- ✓ 台灣地區之地面風速普遍呈高估情形
- ✓ 台灣**西部地區之日間高估**最為明顯

Configuration



D1: 662*386 (15-km)

D2: 1161*676 (3-km)

D2s: 226*306 (3-km)

52 levels in the vertical

CU: Kain-Fritch with new trigger function (used @ D1)

MP: Goddard 5-class

PBL: YSU

CTL & Z0 @ winter

Cases: 2017/12/01 ~ 12/05

	forest	crop	urban
CTL	0.5	0.05	0.5
Z0	0.8	0.3	0.8

資料來源：德國風能協會

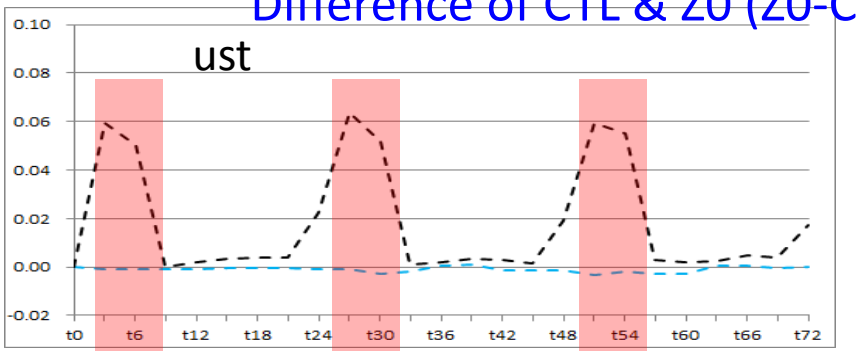
粗糙度Z0 (m)	地表特徵
0.0002	海湖
0.0024	開闊地帶且地勢平坦，如機場跑道
0.03	開闊田野，沒有柵欄、樹木等，但可以有起伏的丘陵和非常分散的矮建築物
0.055	可以有一些房屋和高8米但距離超過1公里的灌木、樹木等的田野
0.1	可以有一些房屋和高8米但距離超過500米的灌木、樹木等的田野
0.2	有很多房屋，灌木和植物，和高8米距離超過250米的樹木等的田野
0.4	小村庄，小城市，或者擁有高大灌木樹木的粗糙不平的田野
0.6	有密集建築群的中等城市市區
1.6	有密集建築群但房屋較高大的大城市市區

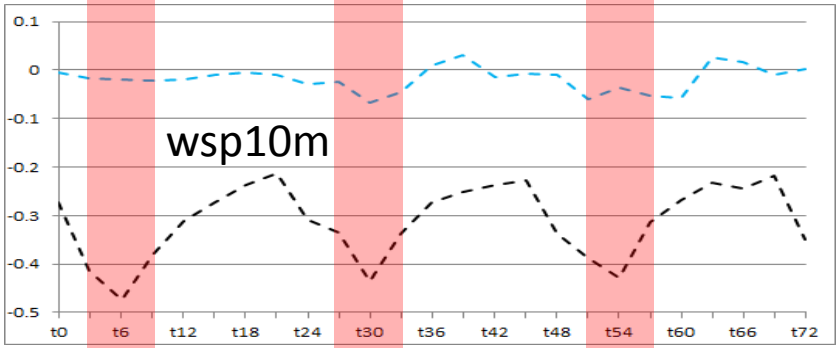
	forest	crop	urban
CTL	0.5	0.05	0.5
Z0	0.8	0.3	0.8

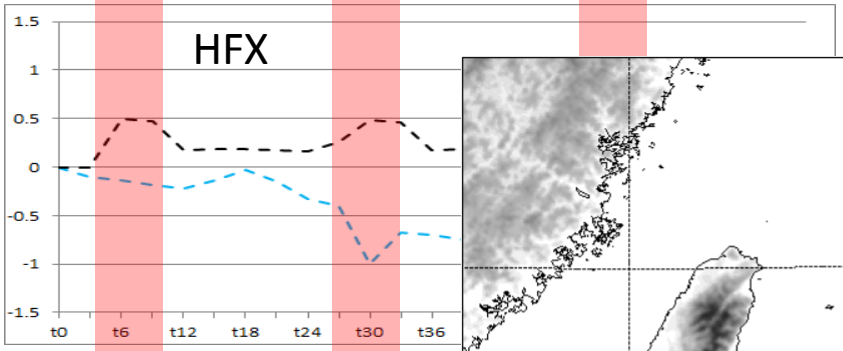
https://wenku.baidu.com/view/62fa8aa8dd3383c4bb4cd29a.html?from=search
(2012/05/04)

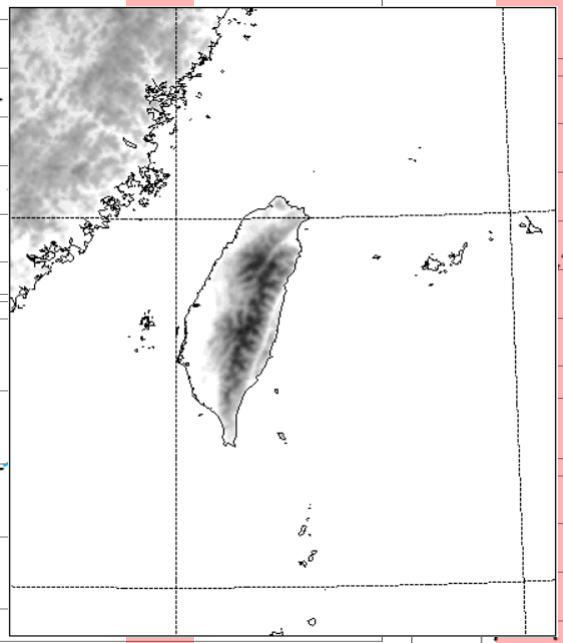
Difference of CTL & Z0 (Z0-CTL)

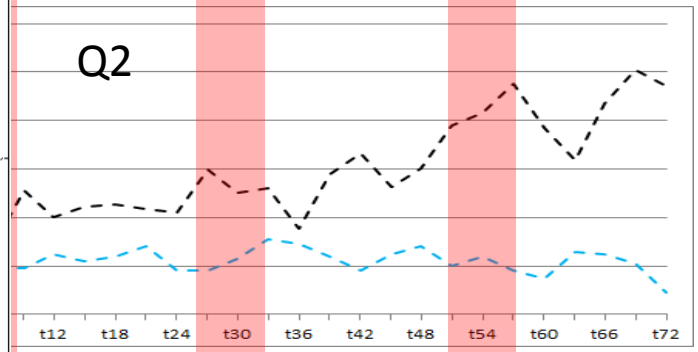
ocean land

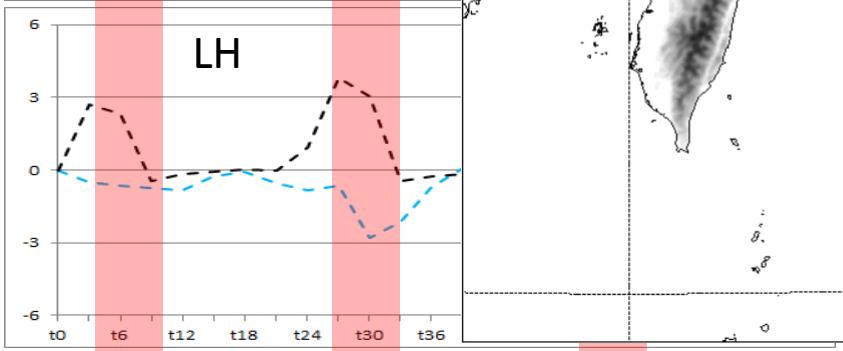


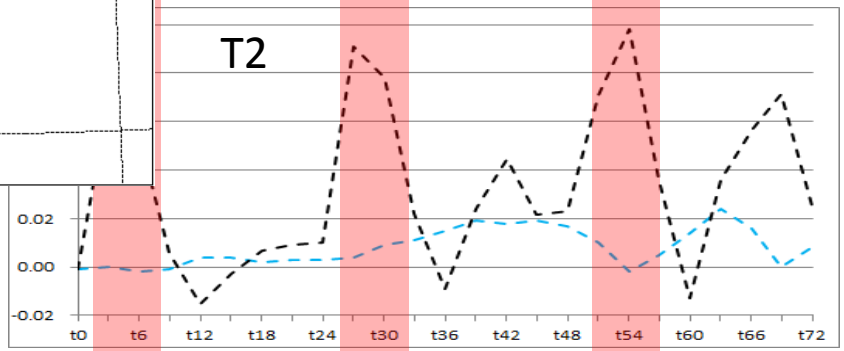


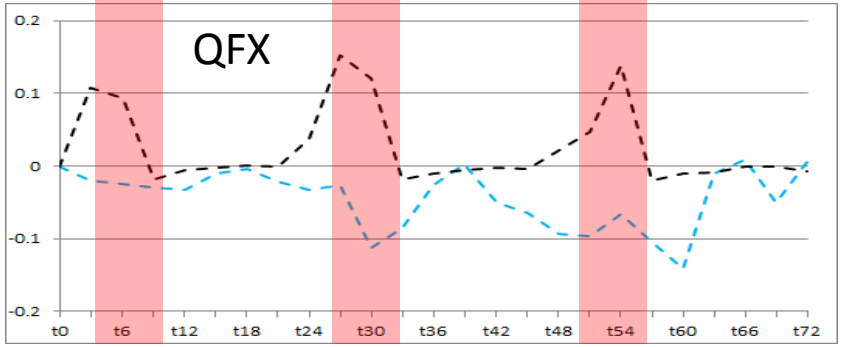










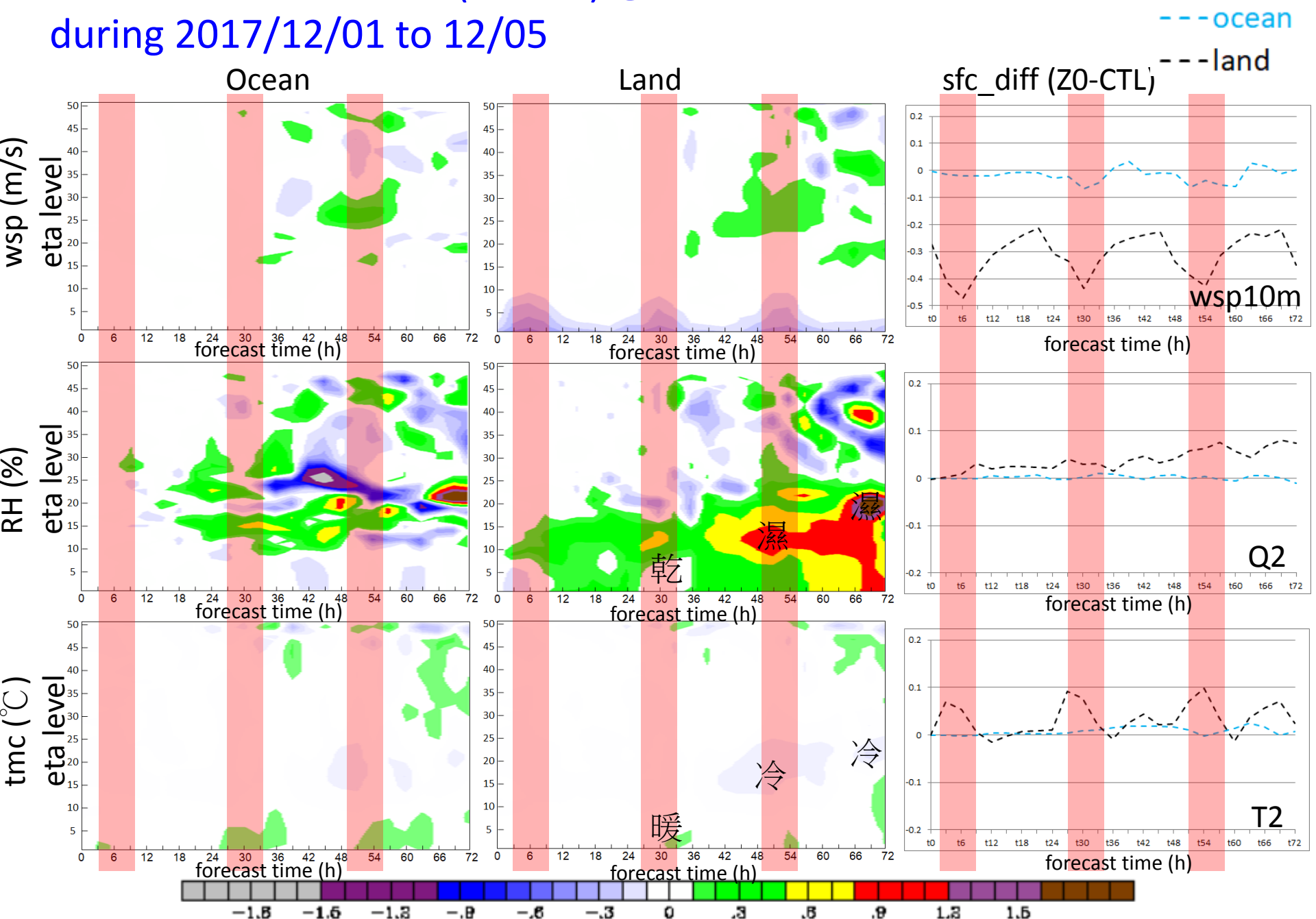


HFX: upward heat flux @ surface (W m^{-2})

LH: latent heat flux @ surface (W m^{-2})

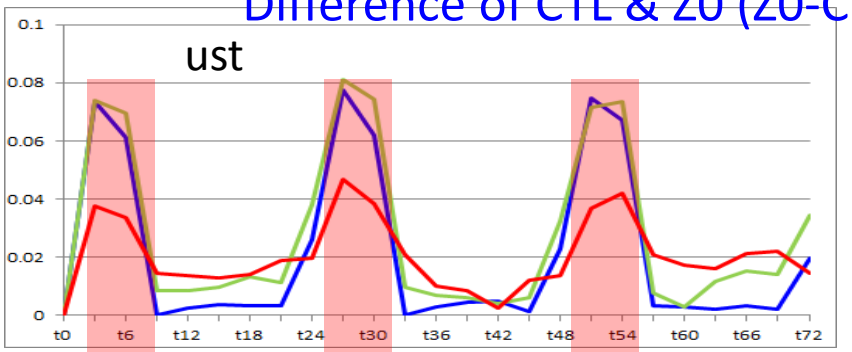
QFX: upward moisture flux @ surface (*10^{-5} kg m^{-2} s^{-1})

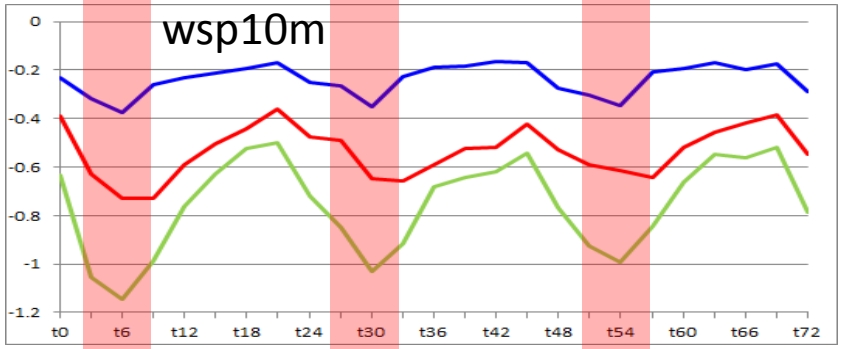
Difference of CTL & Z0 (Z0-CTL) @ ocean & land during 2017/12/01 to 12/05

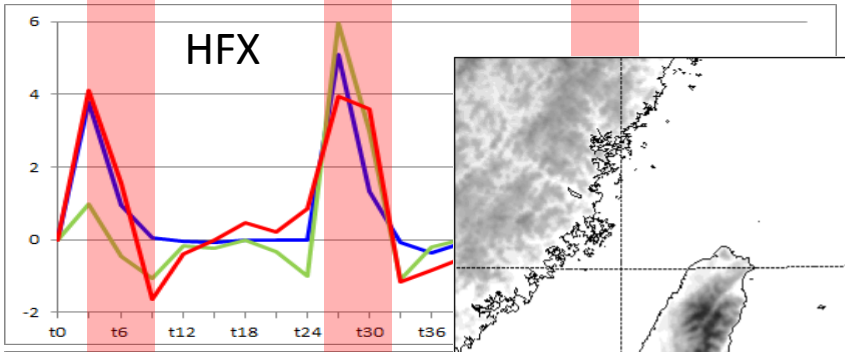


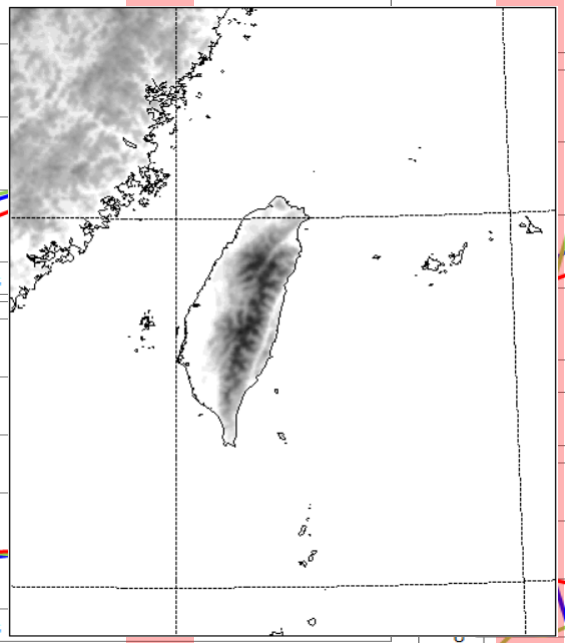
Difference of CTL & Z0 (Z0-CTL)

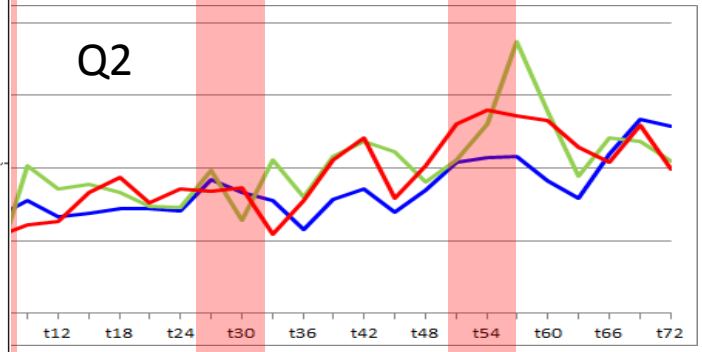
forest crop urban

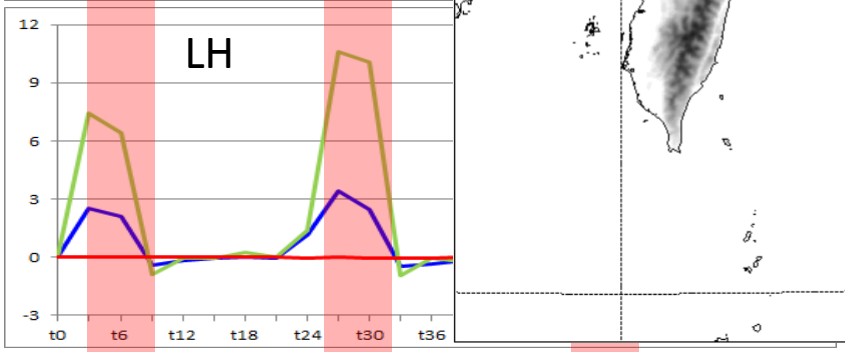


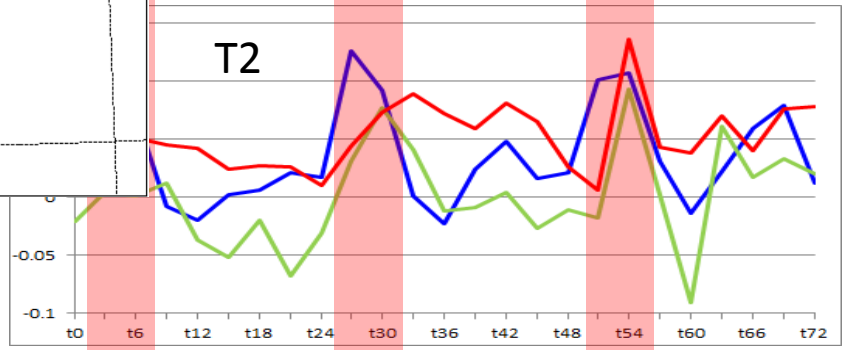


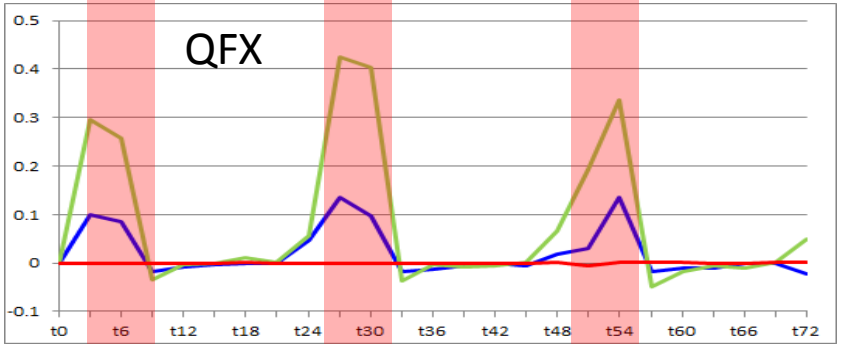












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LH: latent heat flux @ surface (W m^{-2})

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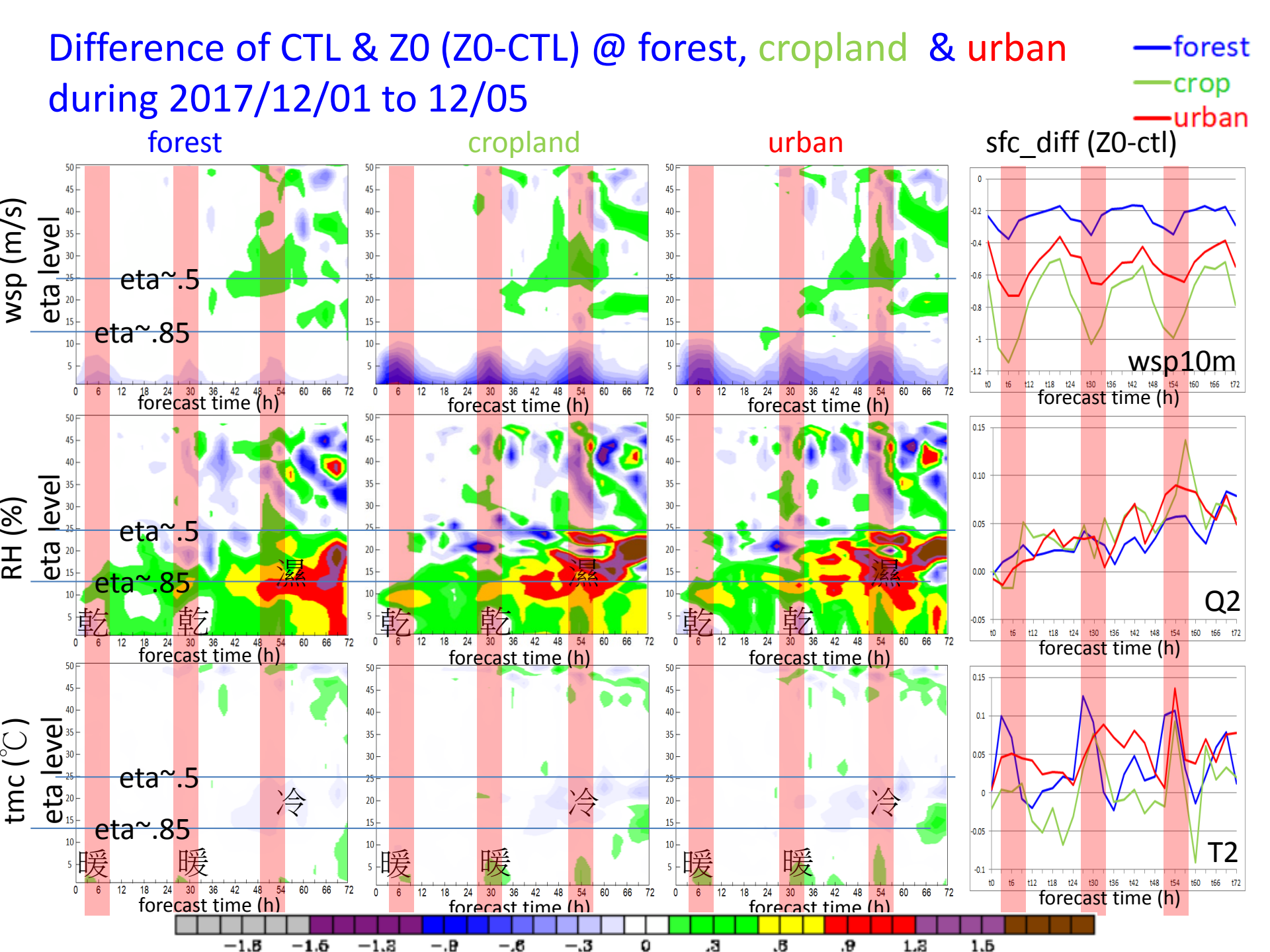
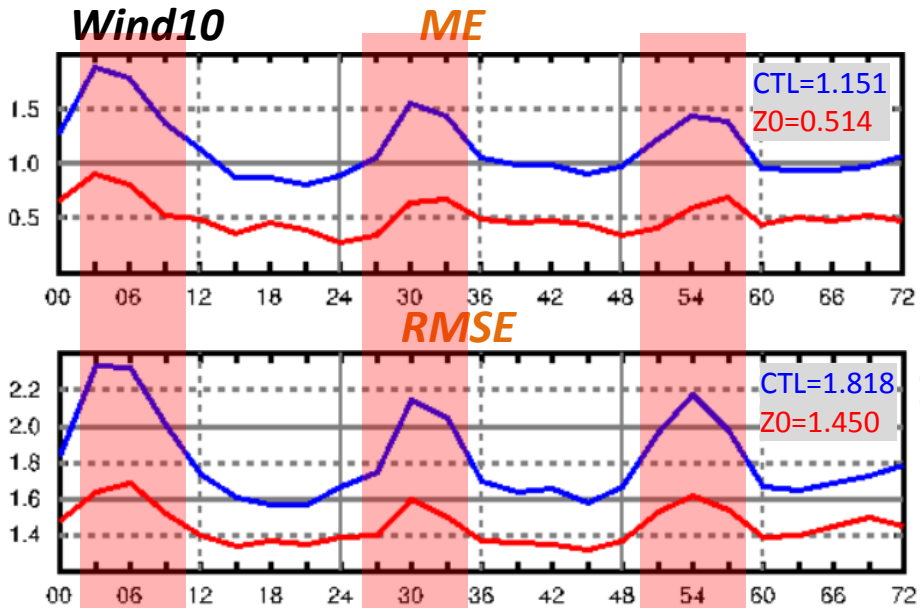
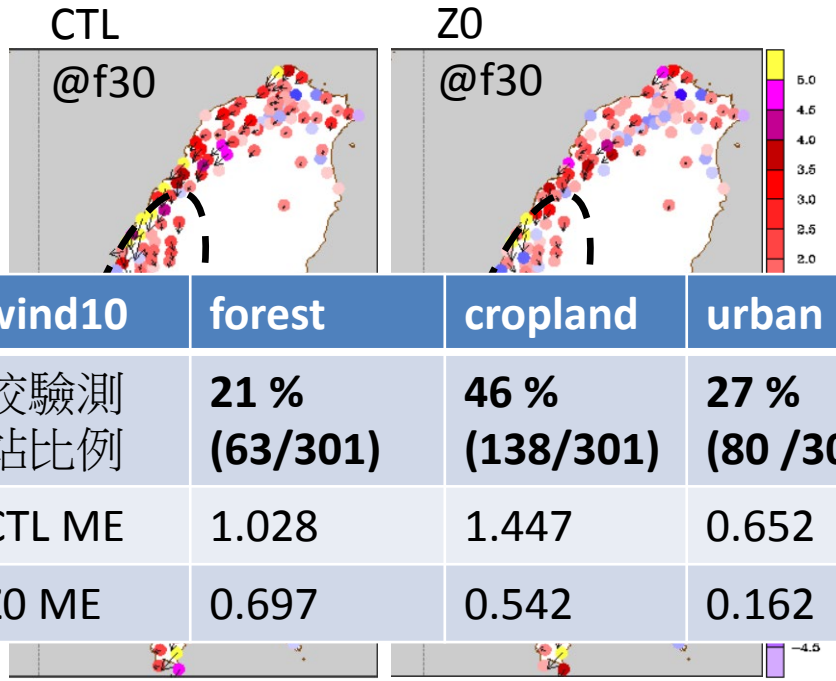
Difference of CTL & Z0 (Z0-CTL) @ forest, cropland & urban during 2017/12/01 to 12/05

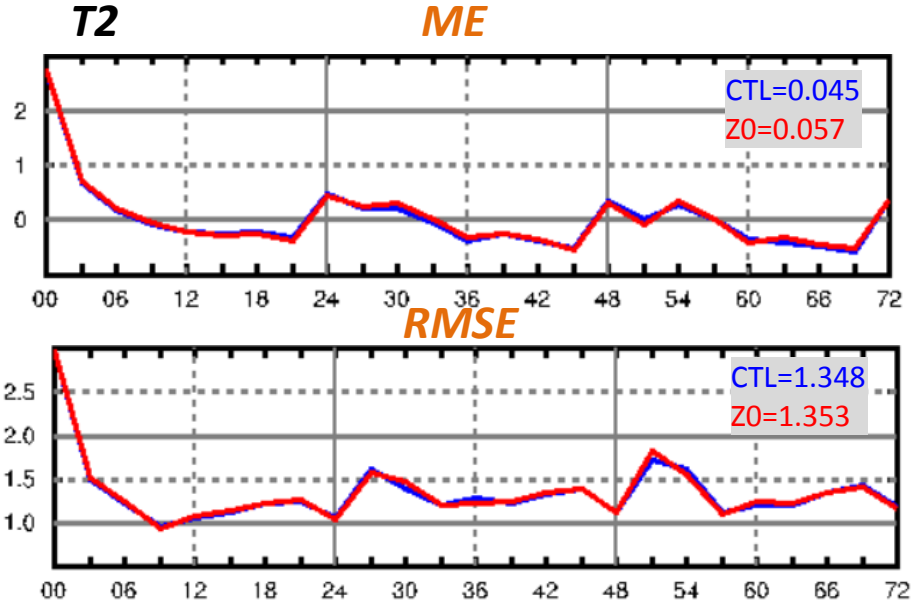


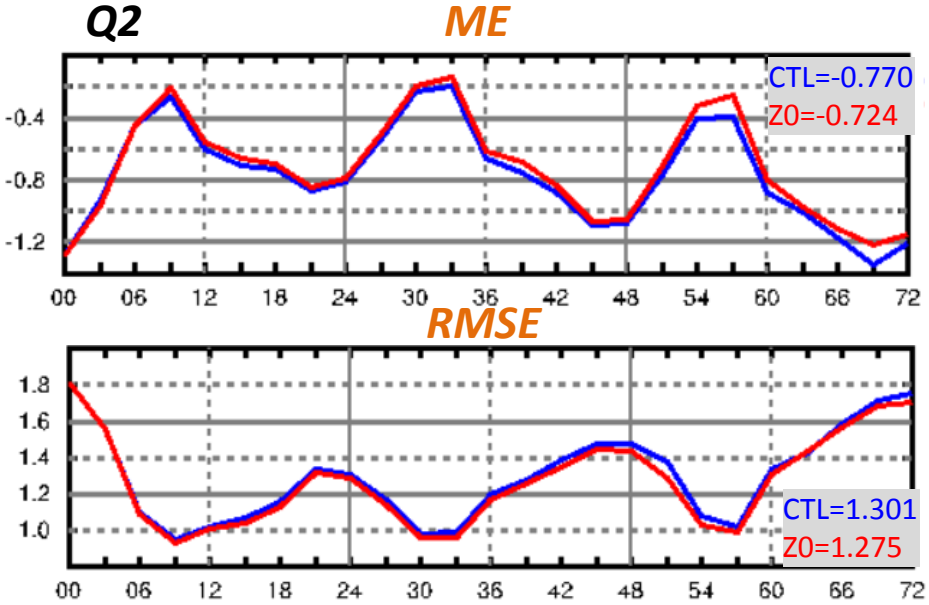
地面校驗
(cases: 2017/12/01 to 12/05)





wind10	forest	cropland	urban
校驗測站比例	**21 % (63/301)**	**46 % (138/301)**	**27 % (80 /301)**
CTL ME	1.028	1.447	0.652
Z0 ME	0.697	0.542	0.162



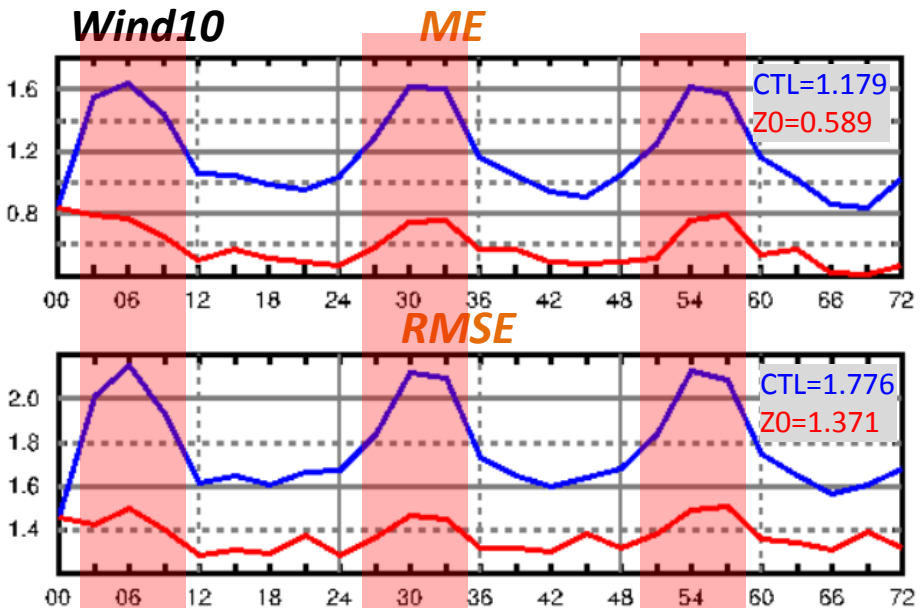


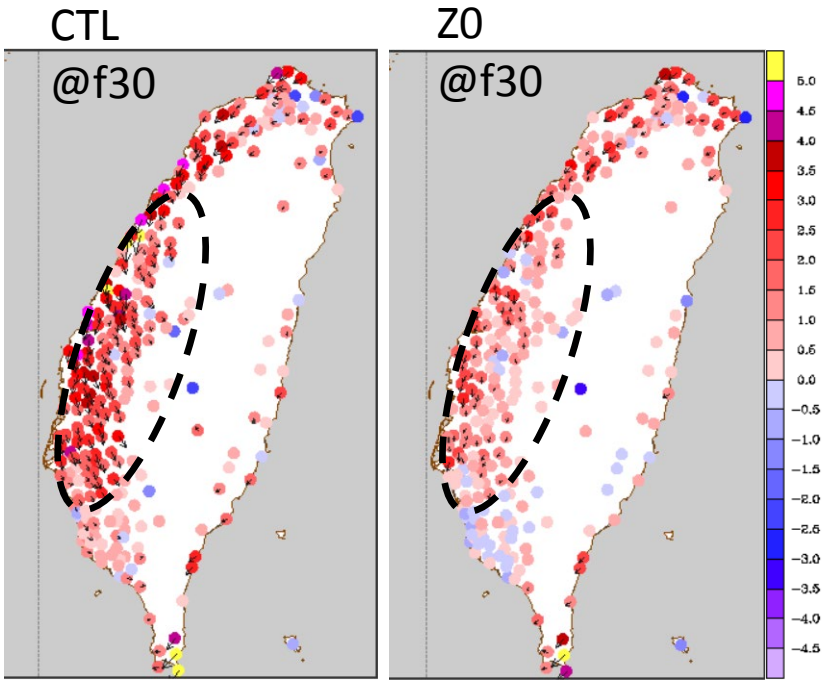
Z0實驗於作業模式預報表現

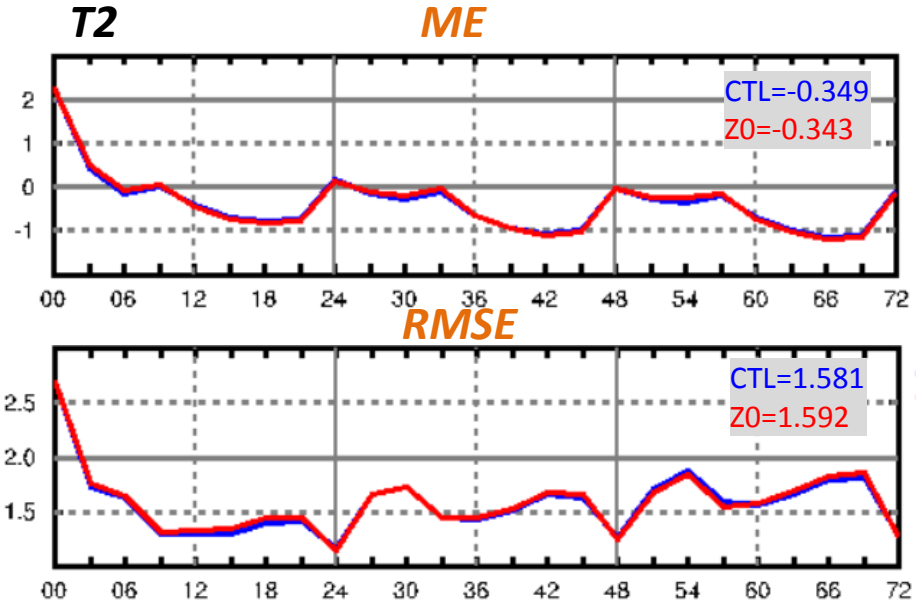
Cases: 2019/01/01 ~ 01/20

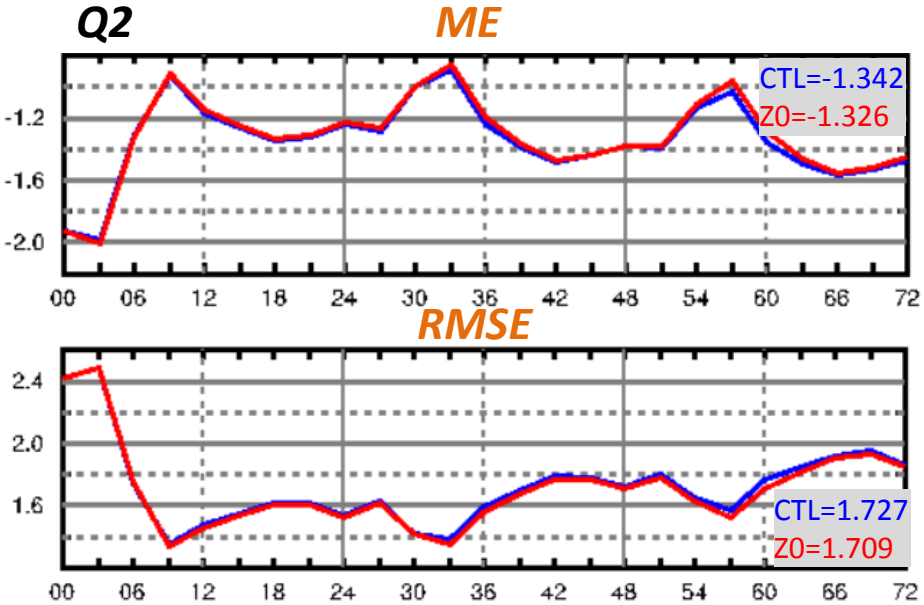
地面校驗

(cases: 2019/01/01 to 01/20)





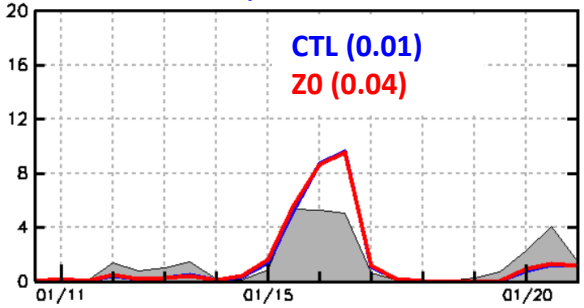


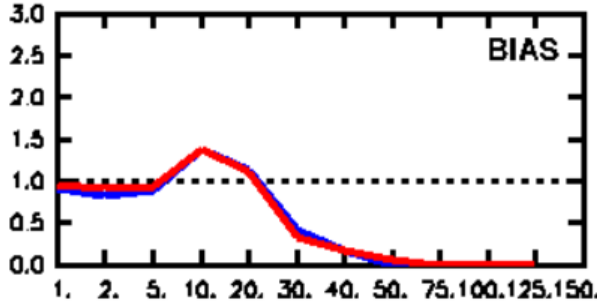


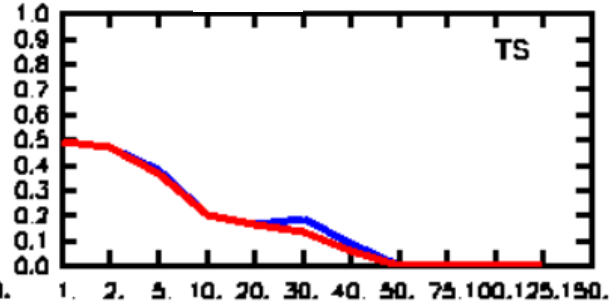
降水校驗 @ Tau = 12 to 60 h
(cases: 2019/01/10 to 01/20)

CTL Z0

Tau 12







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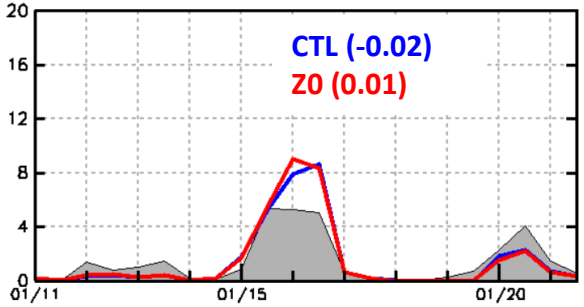

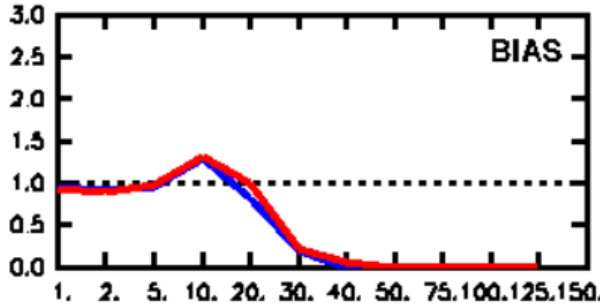

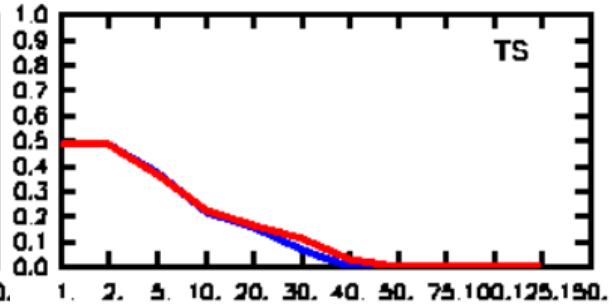

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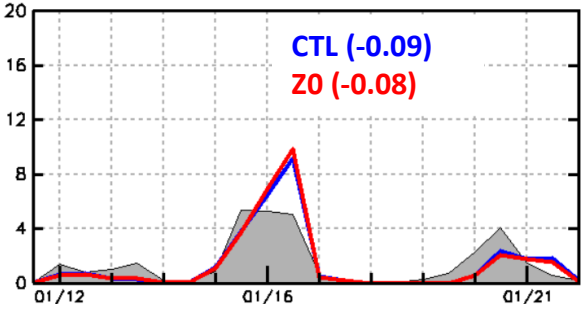

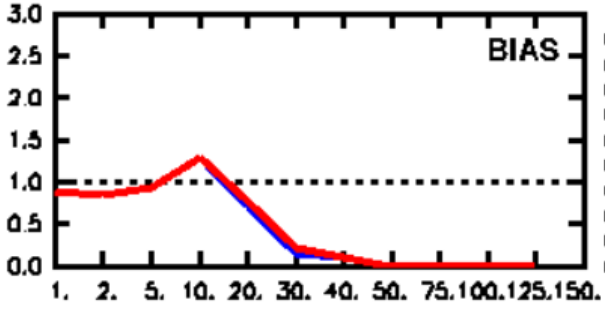

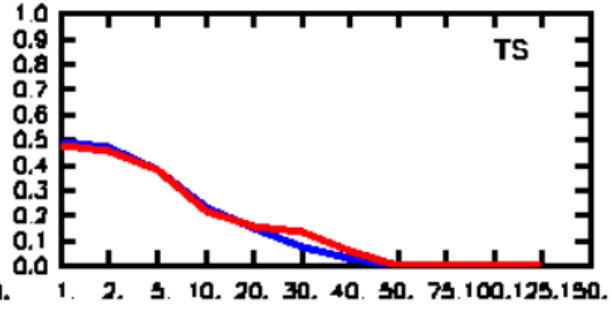

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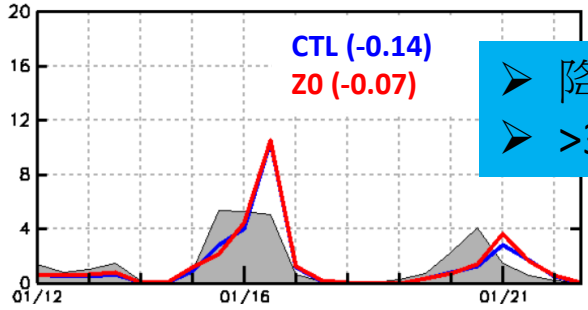

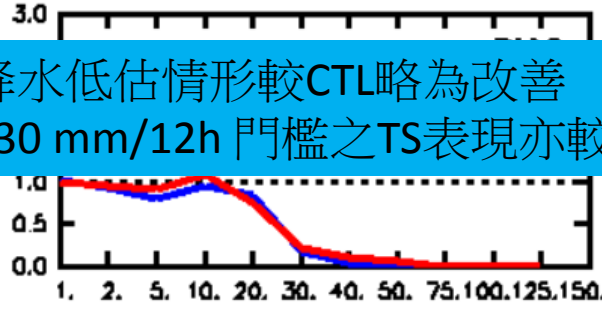

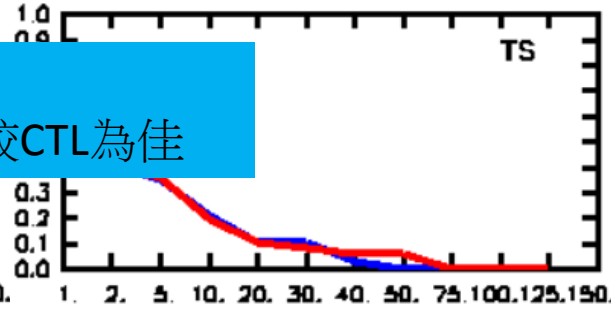

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- 降水低估情形較CTL略為改善
- >30 mm/12h 門檻之TS表現亦較CTL為佳

Summary

- 模式預報台灣地區之地面風速普遍呈高估情形，尤其以台灣西部地區之**日間高估**最為明顯。
- Surface roughness (Z0) 實驗 (2017/12/01 ~12/05)：
  - CTL及Z0之通量垂直傳輸(HFX, LH, QFX)及wind10, Q2, T2於陸點差異呈現明顯的日夜變化
  - 日間ust增加 ➔ wind10減速，且風速減速為低層(eta0.85)大氣
  - 日間熱通量傳輸大 ➔ **低層(eta0.9以下高度)暖乾** & **中層(eta0.9以上高度)濕冷**
  - **cropland**於日間之風速減速及濕度增加較**forest**及**urban**來得明顯
- Z0實驗於作業模式預報表現 (2019/01/01 ~ 01/20)：
  - Z0之wind10風速減速可達0.6 ms^{-1}，尤其日間減速可達0.8 ms^{-1} ；Q2的預報亦較CTL略佳
  - Z0實驗降水低估情形較CTL略為改善，且 >30 mm/12h 門檻之降水得分表現亦較CTL為佳 (Z0實驗之濕通量傳輸LH, QFX較CTL為大，中層濕度較高)