

101年天氣分析與預報研討會

高解析土壤資料同化系統
之效能評估

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Outline

高解析土壤資料同化系統 (HRLDAS)

High Resolution Land Data Assimilation System

- 系統簡介
- 系統之效能評估
- 總結及未來展望

高解析土壤資料同化系統

簡介

Land-air interaction



radiation

Turbulent Heat Flux to/from
Snowpack/Soil/Plant Canopy

Transpiration
Canopy Water
Evaporation

Atmospheric forcing

Precipitation

vegetation

Direct Soil
Evaporation

Sublimation
to/from
snowpack

Evaporation
from Open Water

canopy

Runoff

Land cover/vegetation type

Land-air
couple

Soil Moisture
Flux

$\Delta Z = 10 \text{ cm}$

$\Delta Z = 30 \text{ cm}$

Soil texture

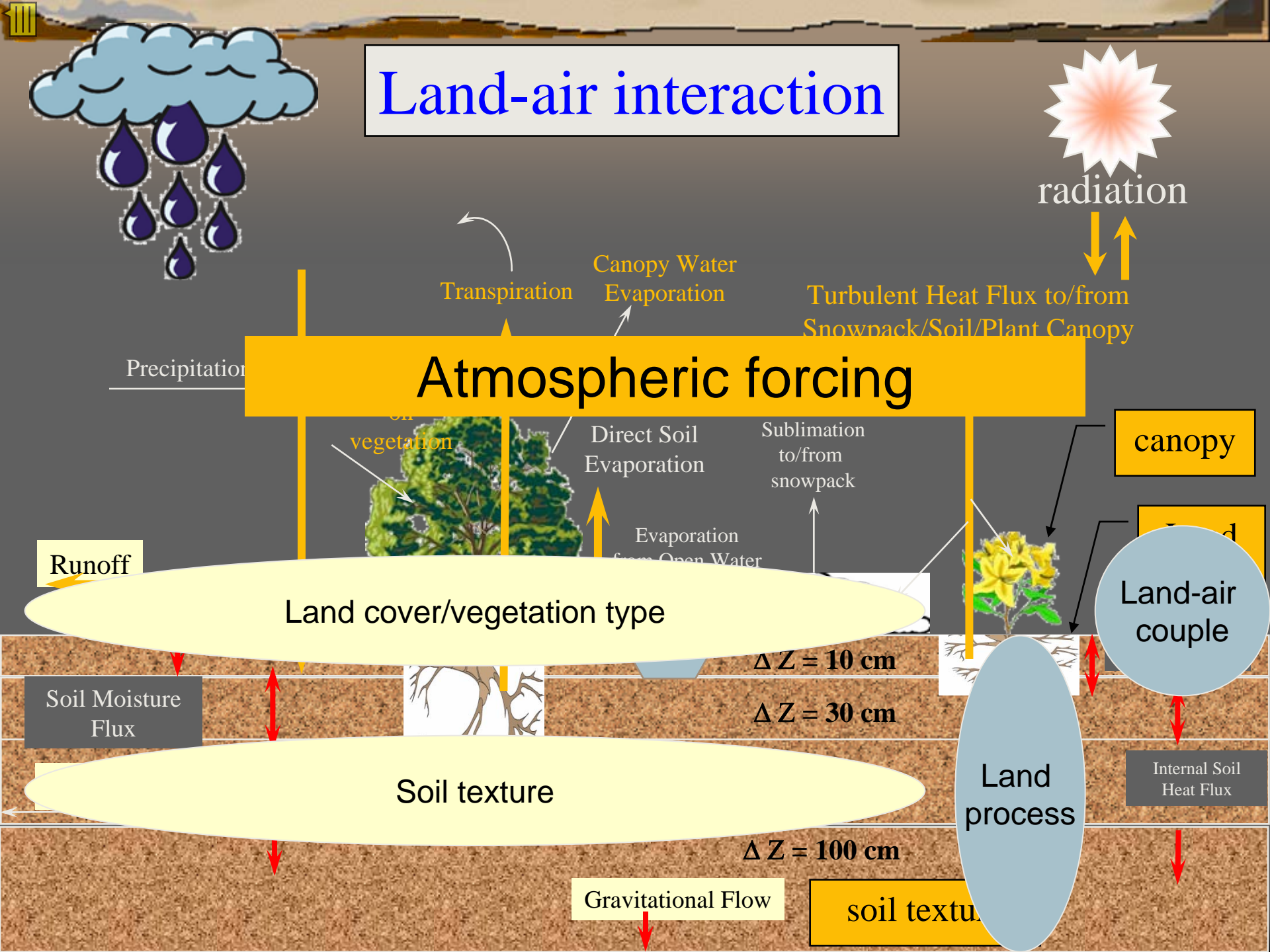
Land
process

Internal Soil
Heat Flux

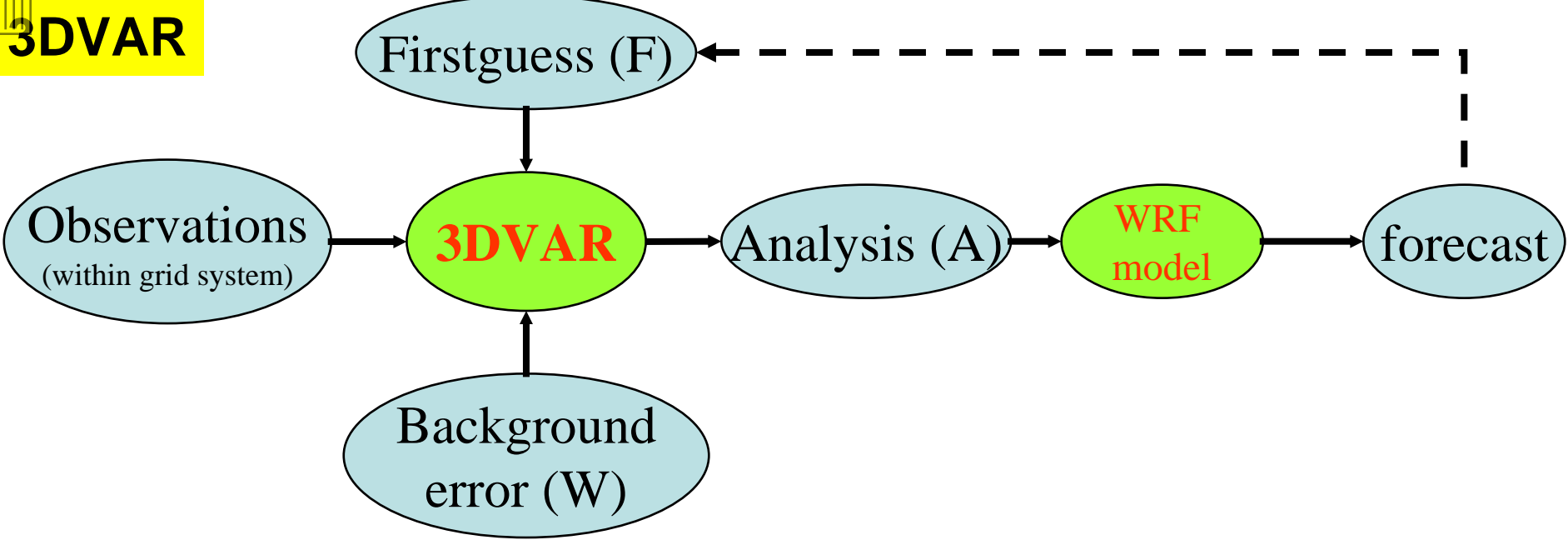
$\Delta Z = 100 \text{ cm}$

Gravitational Flow

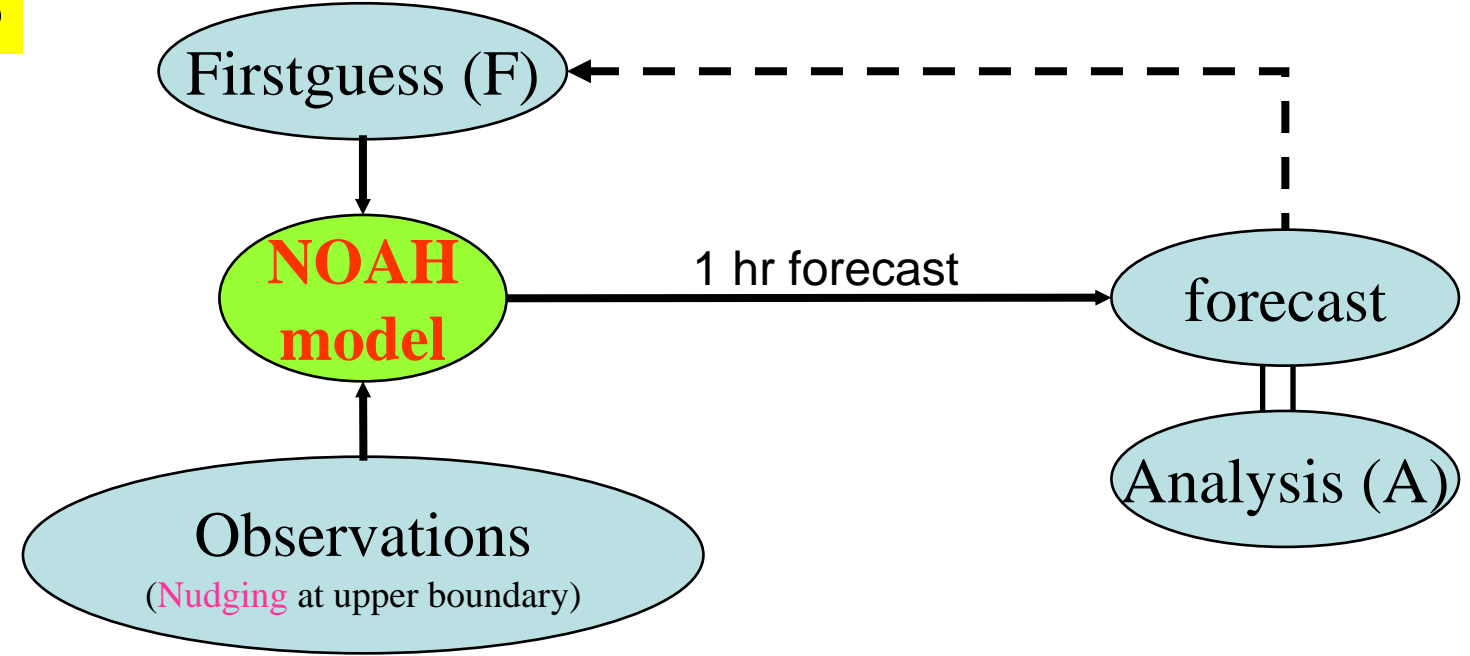
soil texture



3DVAR



HRLDAS



Overview Processing

Snow

(DMS, 00時)
NCEP global domain
↓ `convert_weasd_dms.exe`
to WRF domain

Forcing

(DMS, 逐時)
<WRF M00 6h-12h>:
T2D, Q2D, U2D, V2D,
PSFC, SWDOWN,
LWDOWN

Geogrid

(netcdf, 00時)
<geo_em>:
VEGFRA, GVFMIN,
GVFMAX

Precipitation

(DMS, 逐時)
CMORPH,
QMORPH,
QPESUMS

`gen_ldasin.exe`

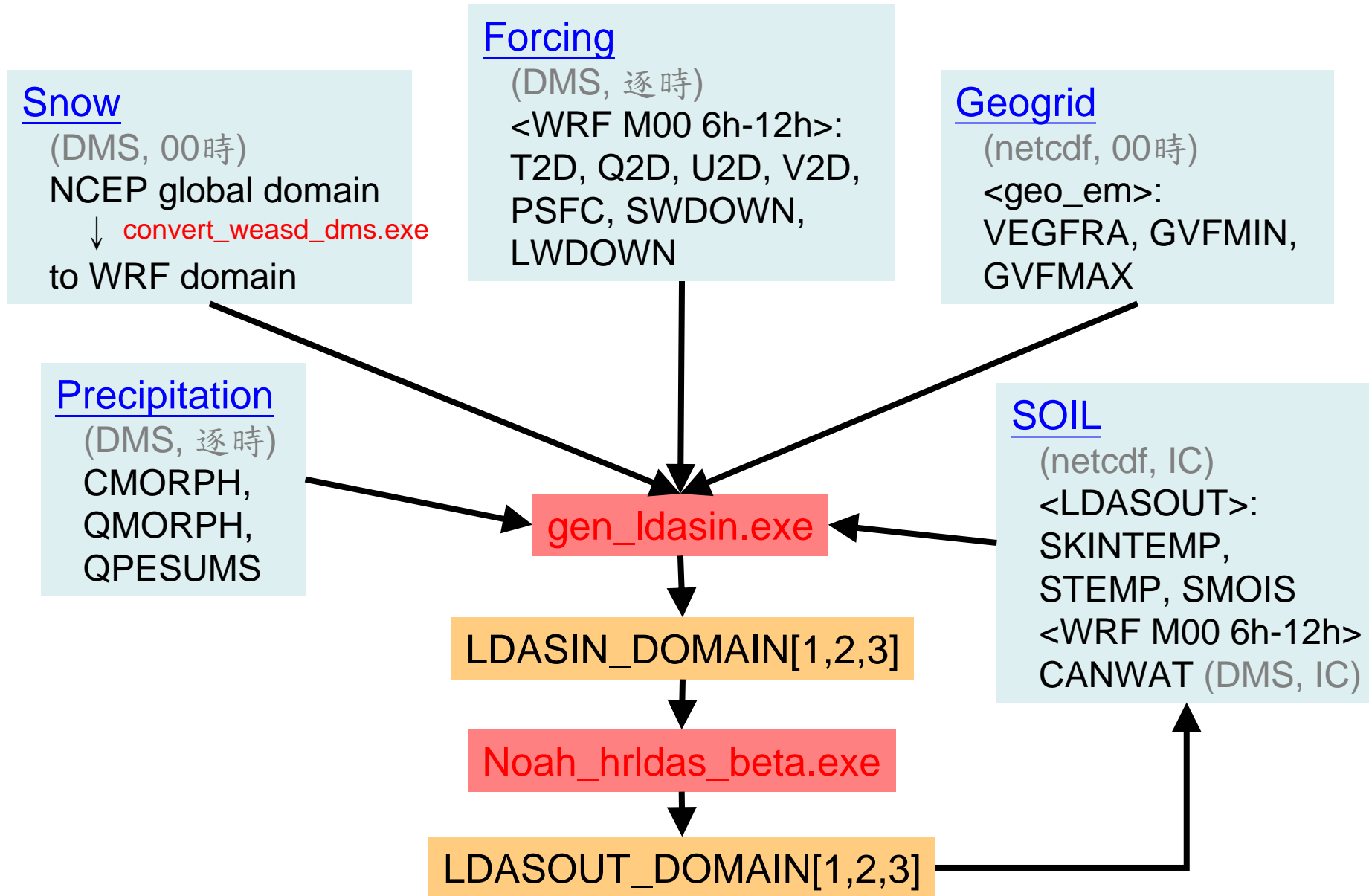
SOIL

(netcdf, IC)
<LDASOUT>:
SKINTEMP,
STEMP, SMOIS
<WRF M00 6h-12h>
CANWAT (DMS, IC)

LDASIN_DOMAIN[1,2,3]

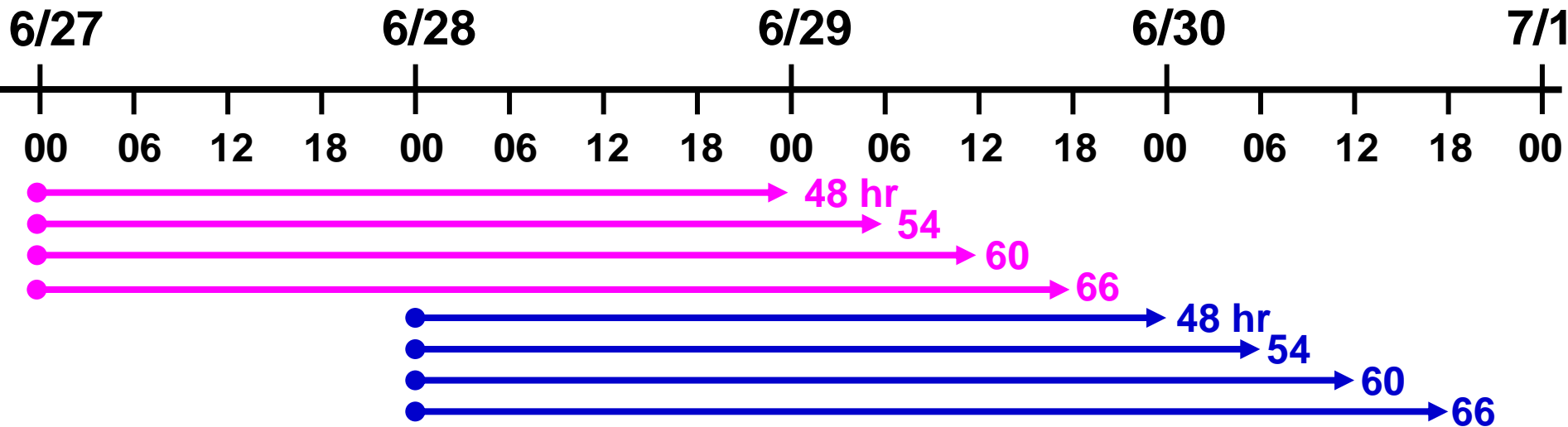
`Noah_hrlDas_beta.exe`

LDASOUT_DOMAIN[1,2,3]



作業策略

NOW

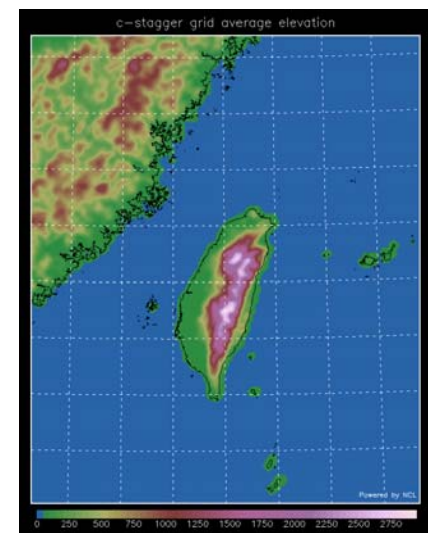


	00	06	12	18
1st run	12:02	18:02	00:02	06:02
2nd run	15:02	21:02	03:02	09:02

(~10 min)

主要輸出：

地表溫度、土壤溫度（四層）、土壤溼度（四層）



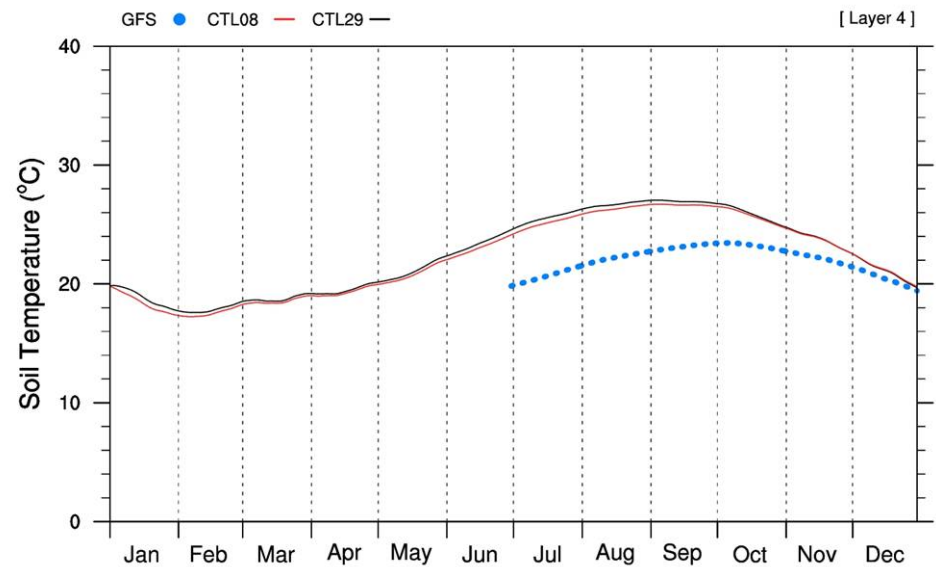
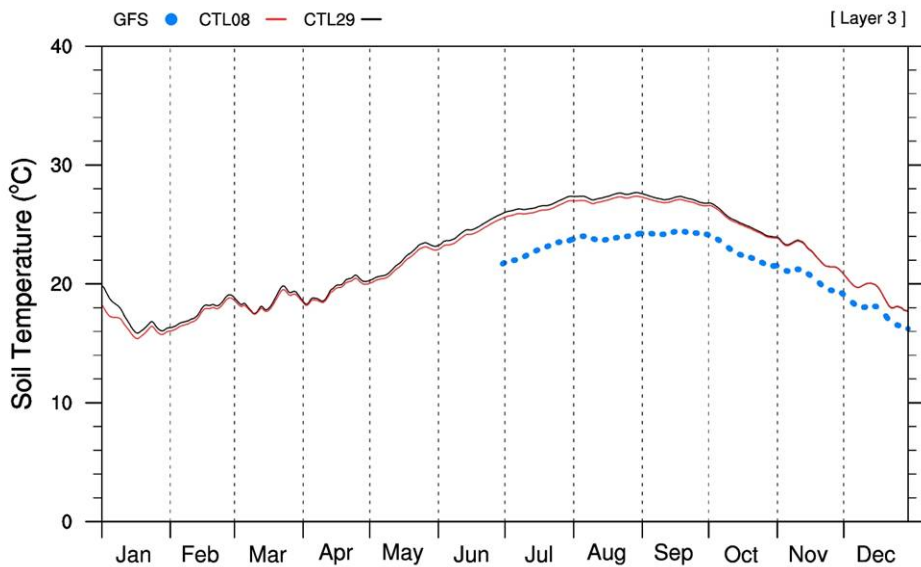
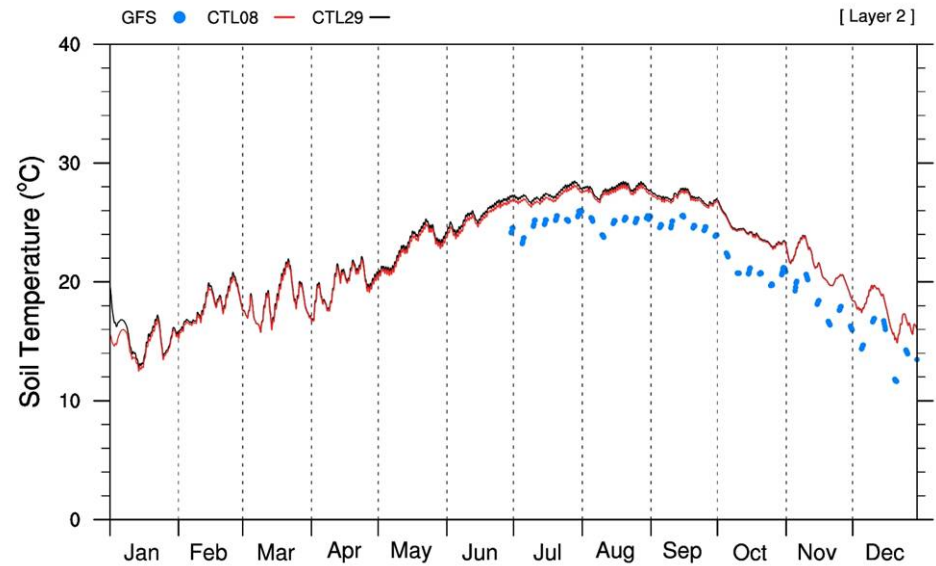
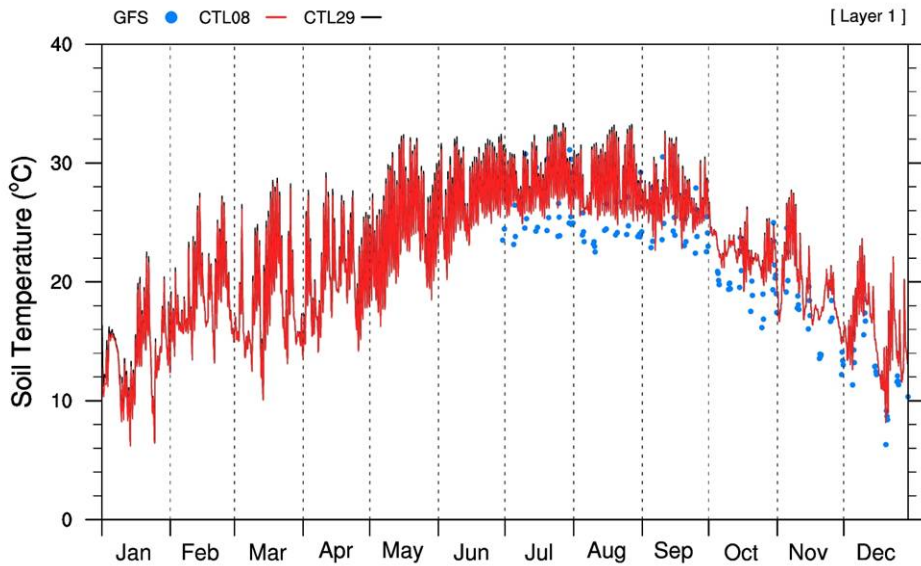
高解析土壤資料同化系統

效能評估

實驗設計

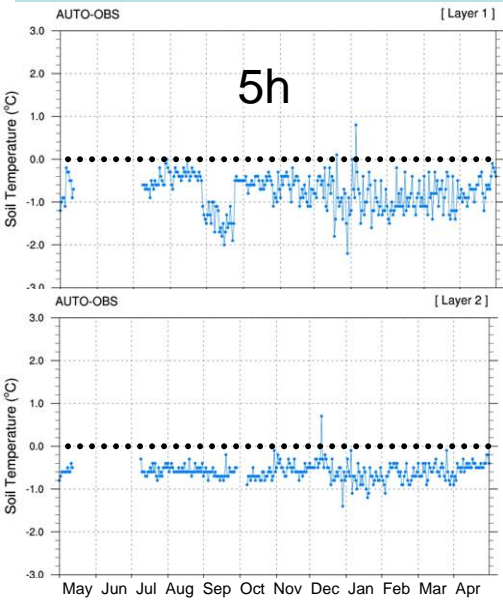
- 時間
 - 2008.1.1~2011.4.30
 - 2009.1.1~2011.4.30
- 實驗
 - WRF土壤分析場(00, 06, 12, 18Z)
 - HRLDAS土壤分析場(逐時)
- 觀測
 - 人工(obs) : 淺層 → 05h, 14h, 21h
深層 → 09h
 - 自動(auto) : 逐時
- 比較
 - HRLDAS spin up problem
 - 人工(obs) v.s. 自動(auto)
 - HRLDAS & WRF v.s. obs
 - HRLDAS & WRF v.s. auto
 - HRLDAS-auto v.s WRF-auto (月平均)

台北站2009年土壤溫度



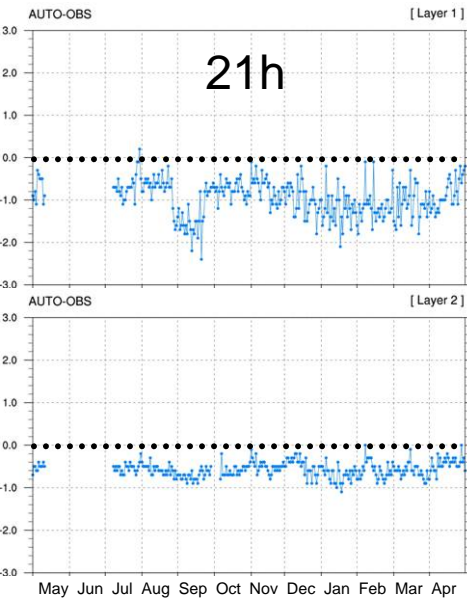
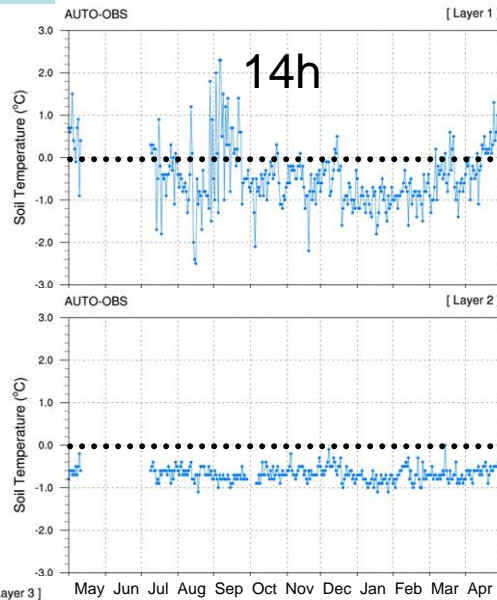
Obs diff (°C) @ Taichung

【2010.5.1-2011.4.30】(自動)-(人工)

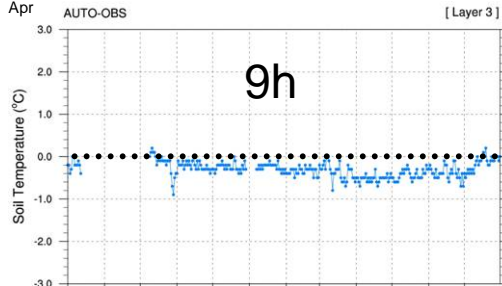


← Layer 1
5 cm →

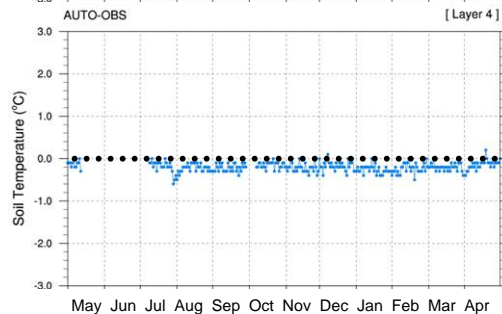
← Layer 2
25 cm →



Layer 3
70 cm →



Layer 4
150 cm →

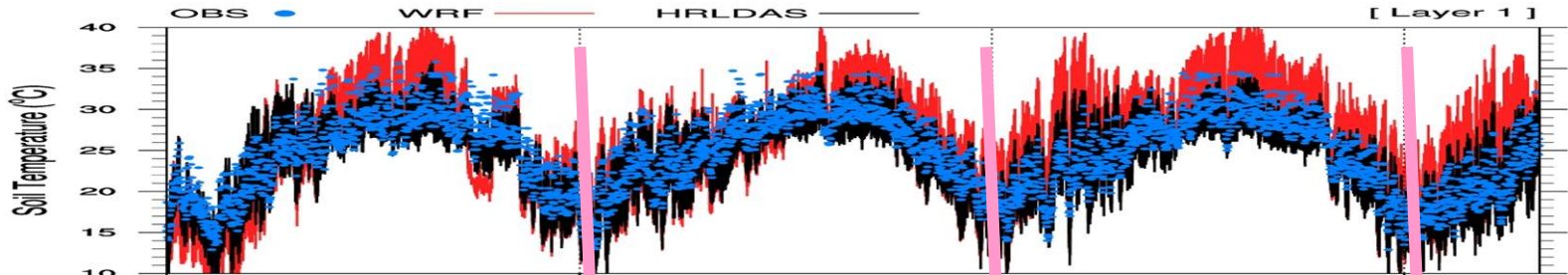


- 溫度差約在-2 ~ +2之間
- 自動站觀測值較冷
- 14h差異最大

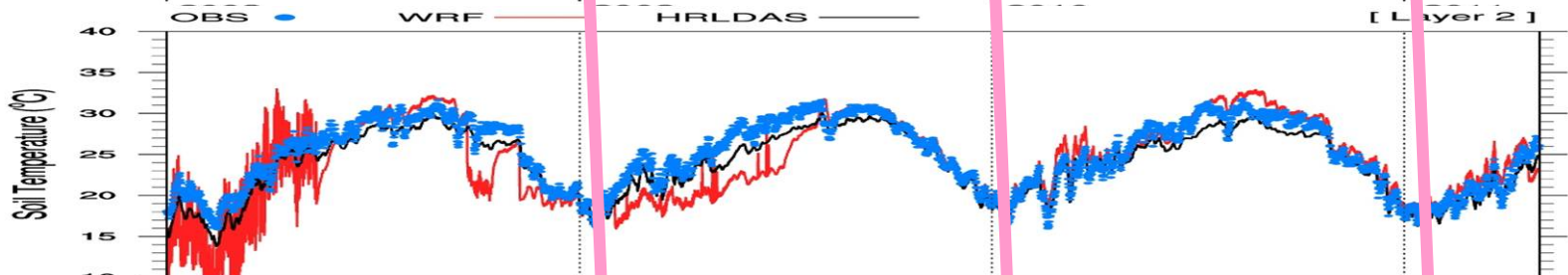
Soil Temperature (°C) @ Taichung

【2008.1.1-2011.4.30】 5,14,21 LST (人工)

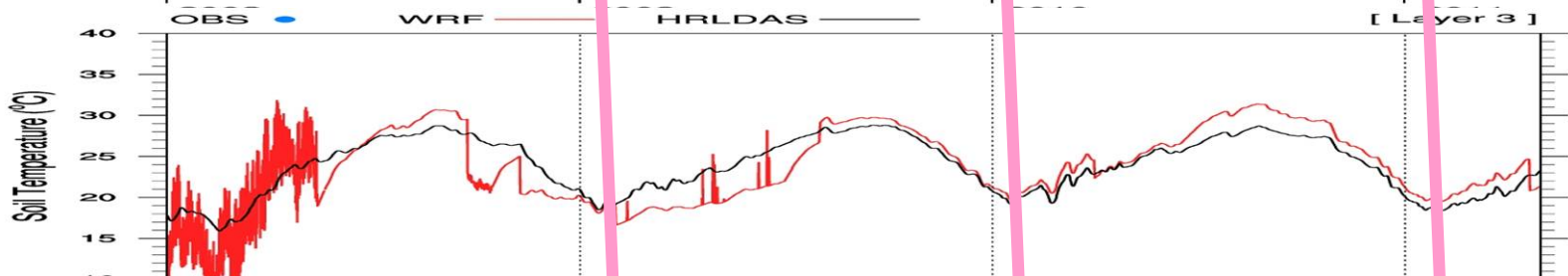
Layer 1
(5 cm)



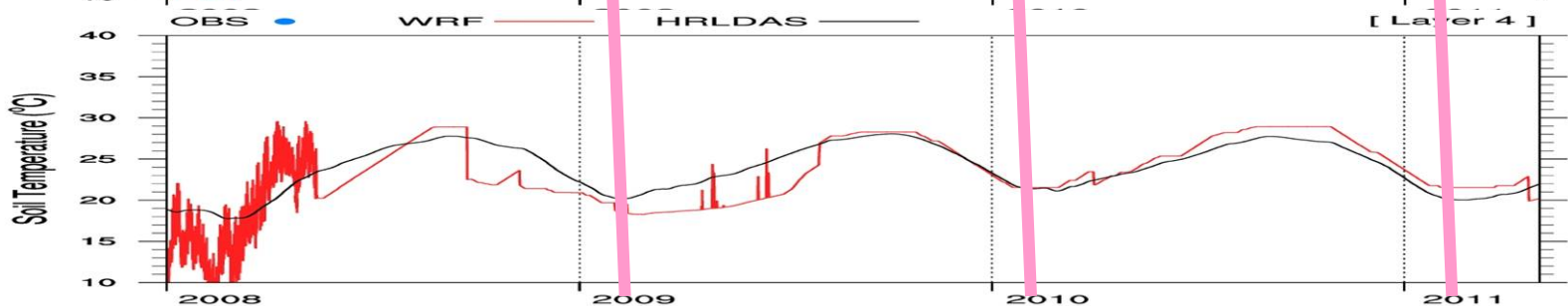
Layer 2
(25 cm)



Layer 3
(70 cm)



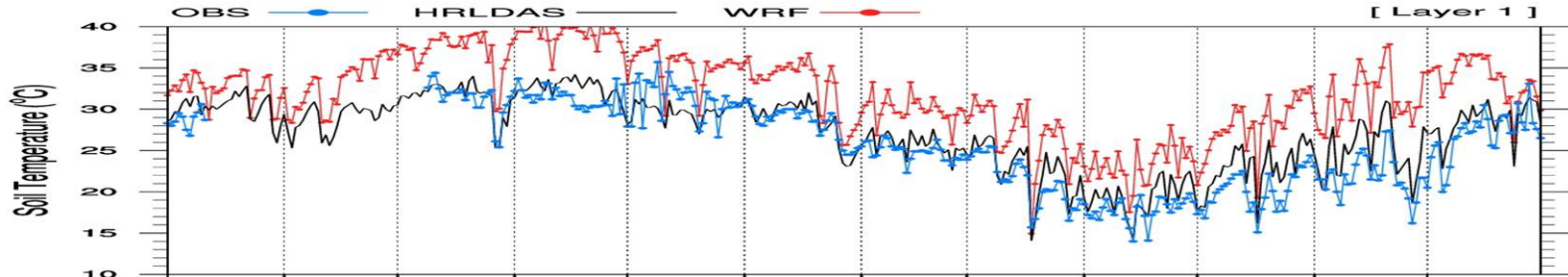
Layer 4
(150 cm)



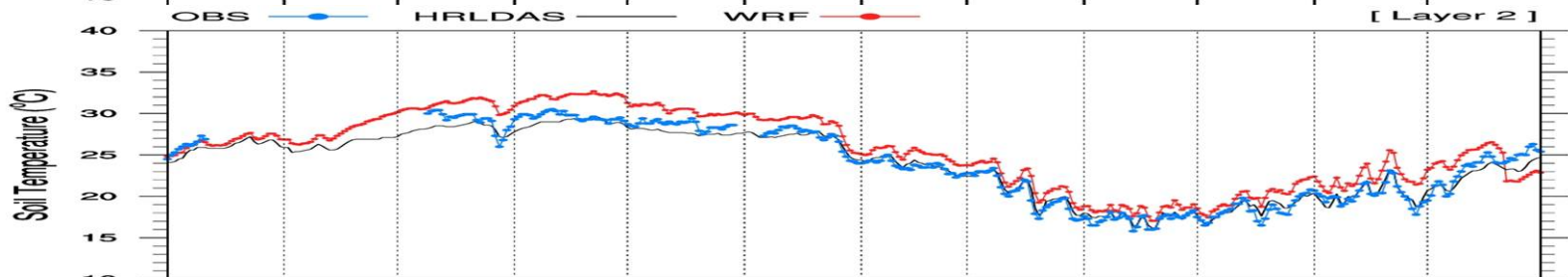
Soil Temperature (°C) @ Taichung

【2010.5.1-2011.4.30】 14 LST (自動)

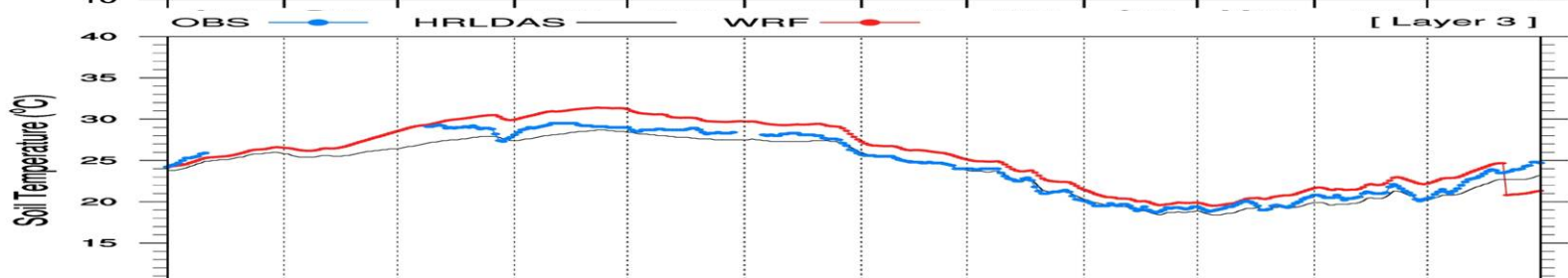
Layer 1
(5 cm)



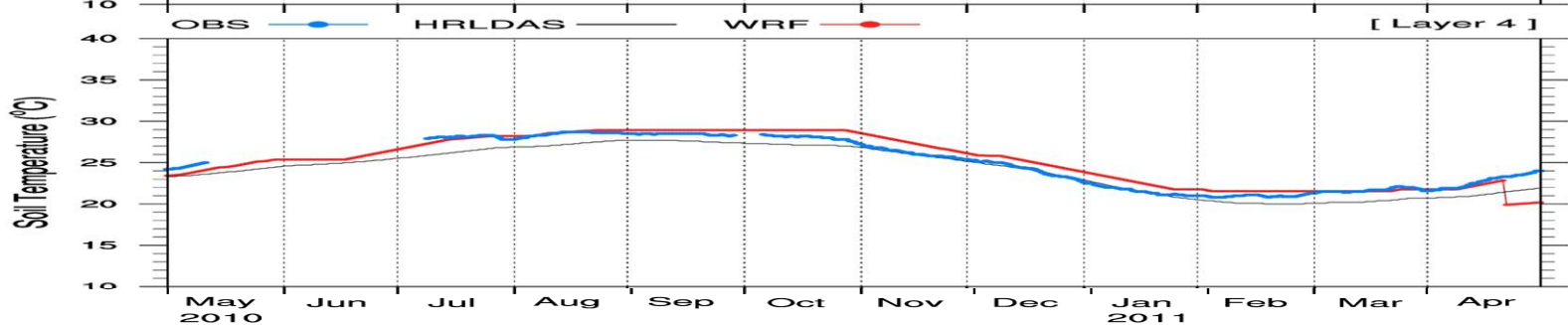
Layer 2
(25 cm)



Layer 3
(70 cm)

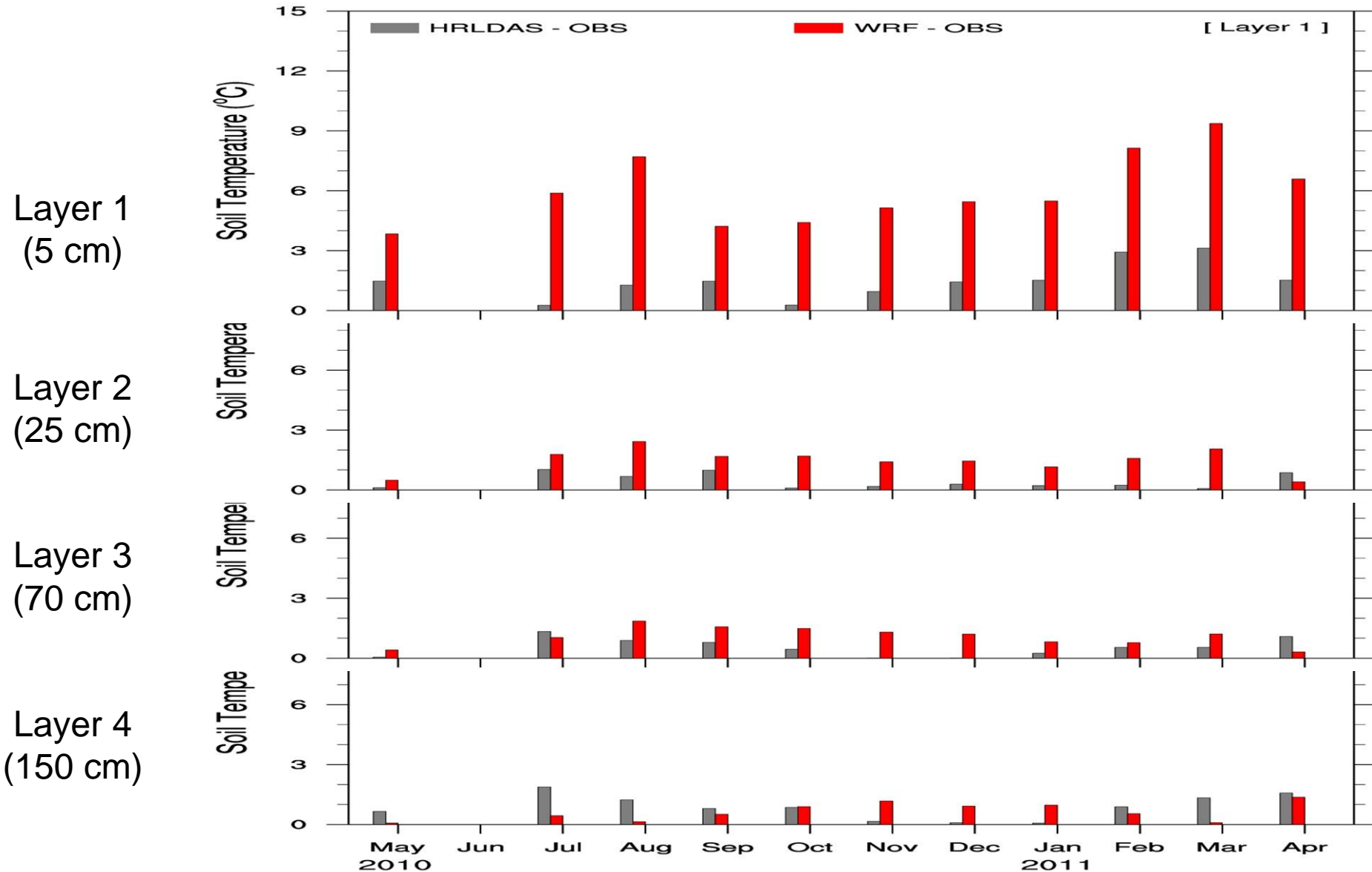


Layer 4
(150 cm)



Soil Temperature (°C) @ Taichung

[2010.5.1-2011.4.30] 14LST monthly average absolute error(自動)



總結與未來展望

- HRLDAS效能評估
 - 經三年模式起轉，系統已和大氣之Forcing data達能量平衡。
 - HRLDAS土壤溫度分析場之表現較WRF土壤溫度分析場好。
- 未來展望
 - HRLDAS-WRF模式偶合測試
 - 觀測有限
 - 間接評估

- The End -