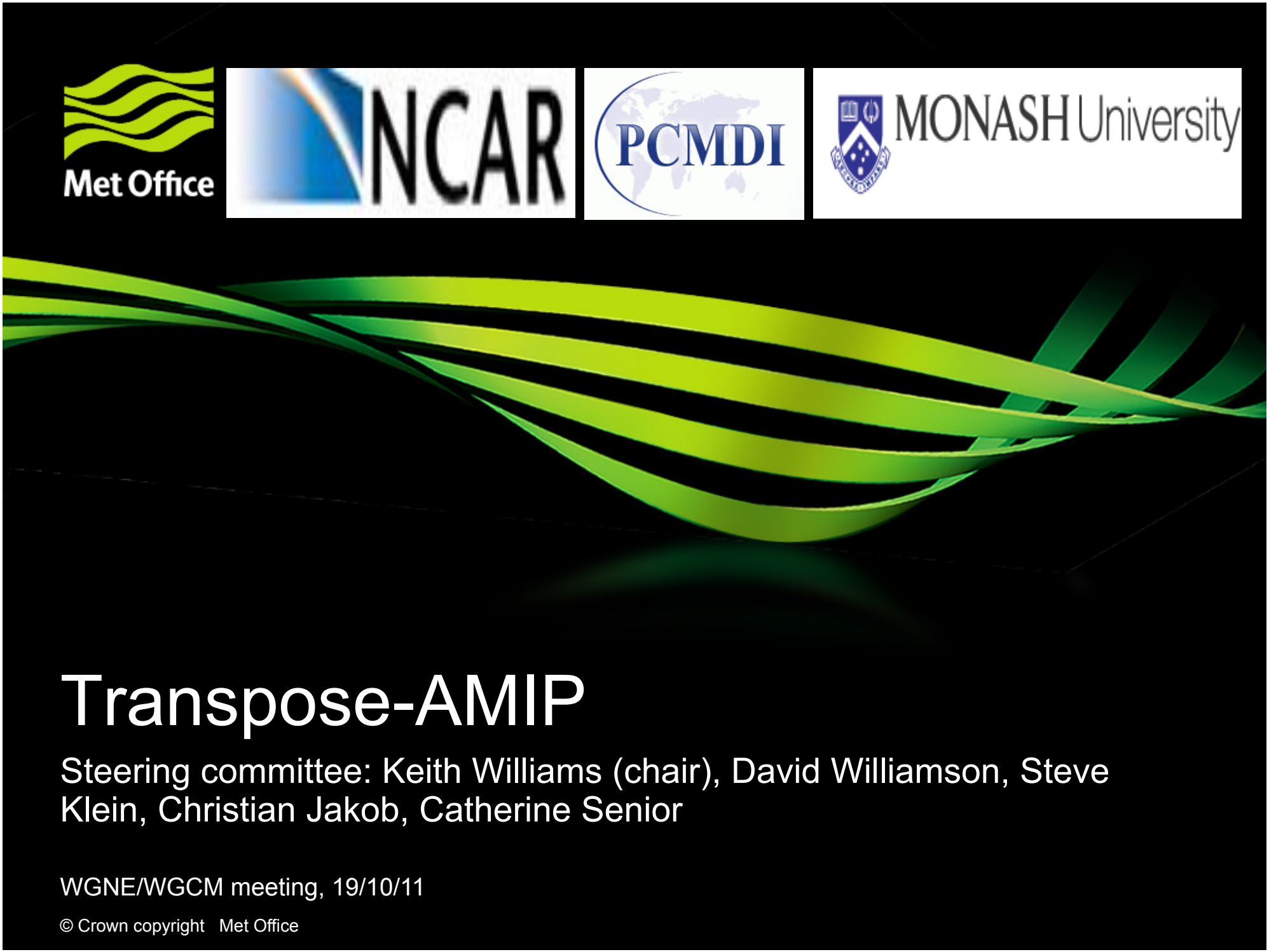

Transpose-AMIP

Steering committee: Keith Williams (chair), David Williamson, Steve Klein, Christian Jakob, Catherine Senior

WGNE/WGCM meeting, 19/10/11

What is Transpose-AMIP?

- Basically, running climate models in NWP mode.
- Core expt for Transpose-AMIP II is to run 64 hindcasts, each 5 days long, initialised from ECMWF YOTC analysis.
- Optional expt to repeat the same set of hindcasts with NASA MERRA re-analysis or own analysis.
- The hindcasts are spread through the annual and diurnal cycles during 2008/9 and were chosen to tie in with YOTC and coincide with some of the IOPs in:
  - VOCALS (SE Pacific stratocumulus)
  - AMY (Asian monsoon)
  - T-PARC (mid-latitude Pacific)
- Any global modelling centre (NWP or climate) can submit data. Those taking part in CMIP5 should use the same model as is being used for their AMIP simulation.
- **Jointly endorsed by WGNE and WGCM**.

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Status of Transpose-AMIP II

Status of experiments:

	Expt pledged	Expt run	Data converted	Data on ESG
EC-Earth (Frank Selten)	✓	Awaiting CMIP5 runs		
IPSL (Sandrine Bony/Solange Fermepin)	✓	Technical issues		
Met Office (Keith Williams)	✓	✓	✓	✓
Meteo France (Michel Deque)	✓	✓	✓	Awaiting ESG upload
MIROC (Masahiro Watanabe)	✓	✓	✓	Awaiting ESG upload
MPI (Bjorn Stevens)	✓			
MRI (Tomoaki Ose)	✓	Awaiting CMIP5 runs		
NCAR (David Williamson/Brian Medeiros)	✓	Awaiting CMIP5 runs		

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Proposed diagnostic subprojects:

- Relationship between short and long timescale model errors (PI: Shaocheng Xie)
- MJO dynamics in the Transpose-AMIP II hindcasts: (PI: Mitch Moncrieff)
- Water budget analysis (PI: Gill Martin)
- Comparison of methodologies (initial tendency using own analysis vs 5-day forecast using alien analysis) (PI: Mark Rodwell)
- Cloud regimes (PI: Keith Williams)
- Intense extratropical windstorms (PI: Peter Knippertz)
- VOCALS analysis (PI: Thomas Toniazzo)
- Comparison of current climate and NWP models (PI:TBD)
- Regional investigation into model tendencies (PI: TBD)
- 2009 SE Asian monsoon analysis (PI: TBD)

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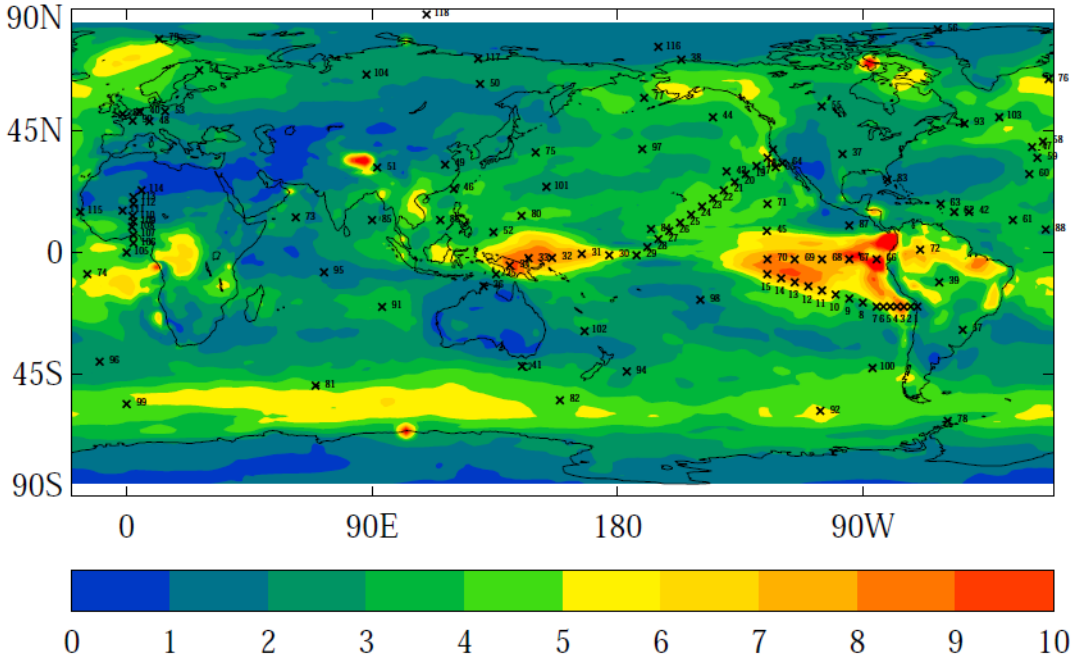
- Data formats and the process for downloading is the same as CMIP5 (select ‘TAMIP2’ as the project on the ESG).
- The transpose-AMIP II diagnostic lists are largely based on the CFMIP component of the CMIP5 lists (including COSP output, etc.).
- Data will be saved globally every 3 hours and the CFMIP sites diagnostic list will be saved every 30 mins.



Includes:
ARM sites
Cloudnet sites
GPCI
…

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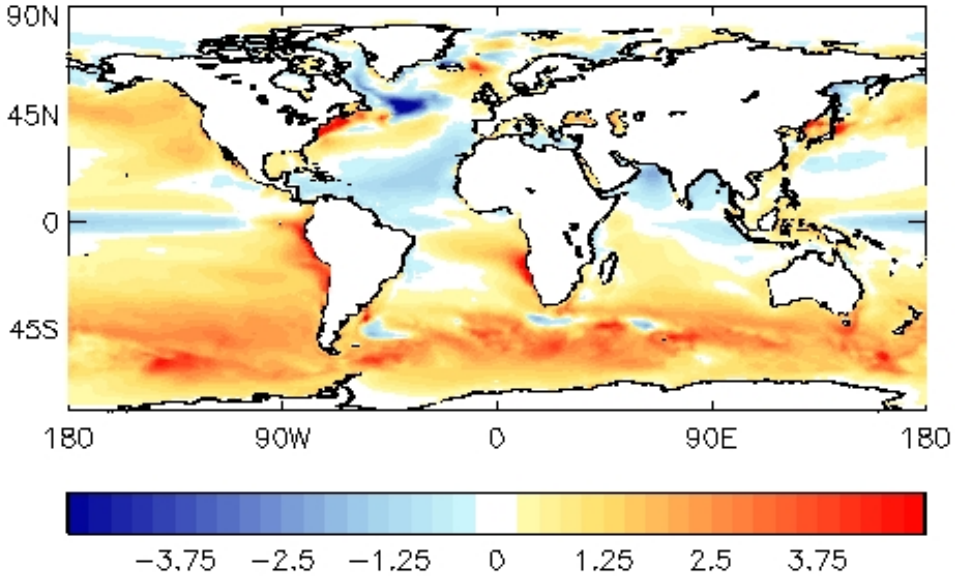
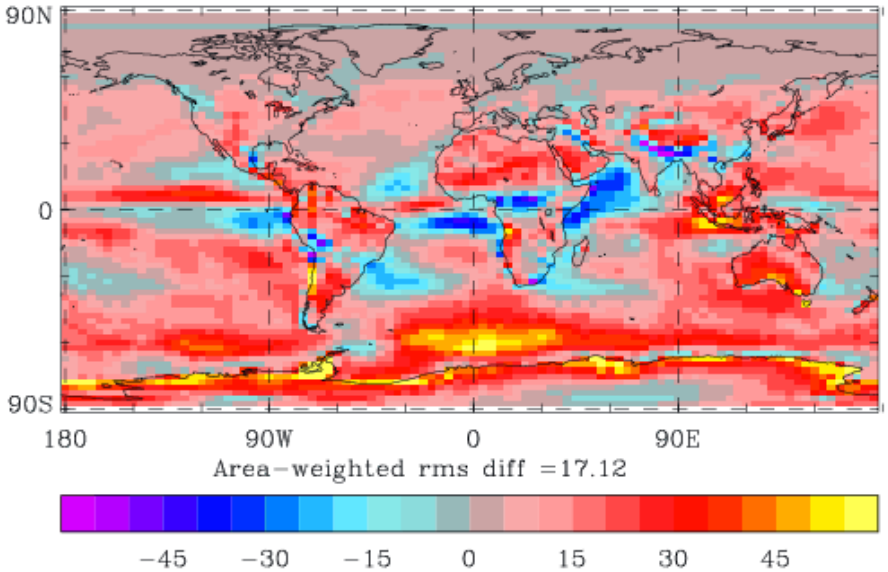
Example analysis:
Southern Ocean surface SW bias

SST warm bias in the Southern ocean

Coupled SST bias



Surface net SW down bias



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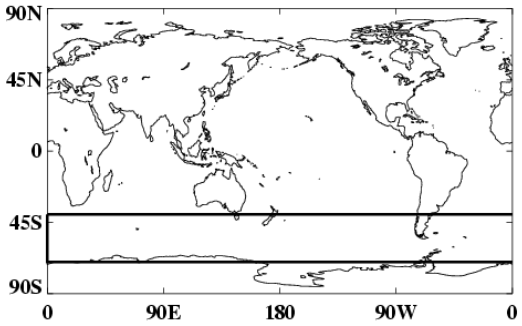
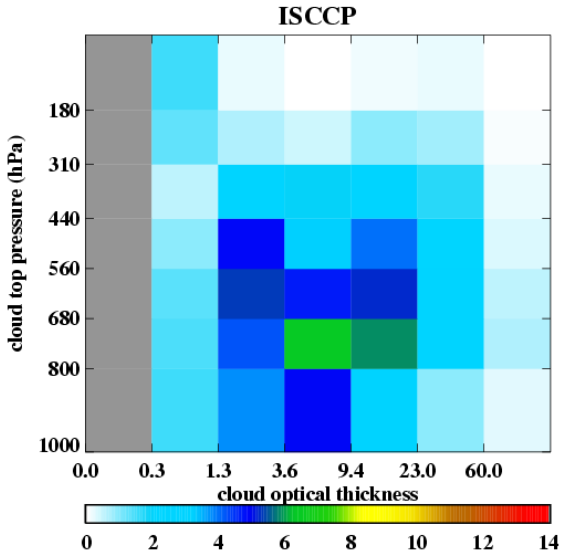
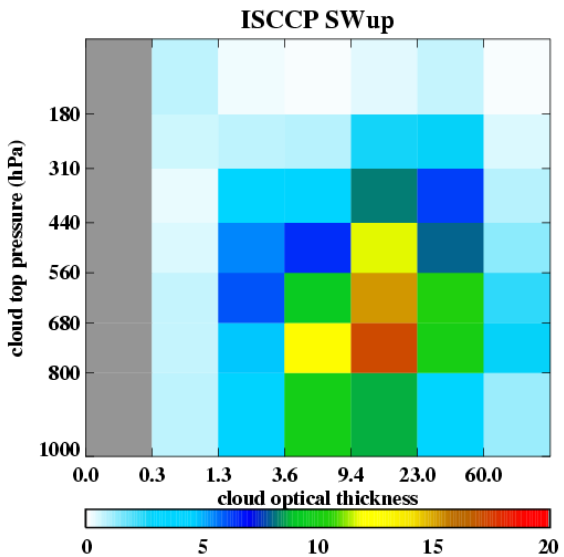
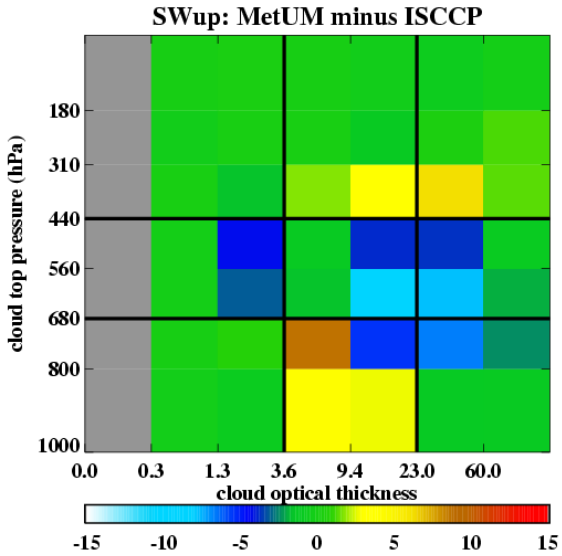
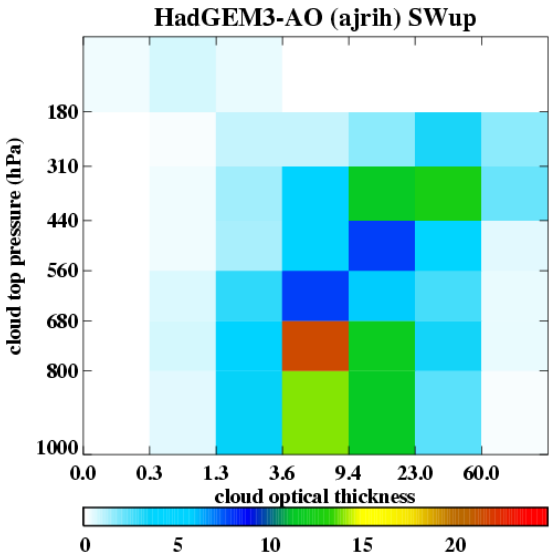
ISCCP cloud and SW bias

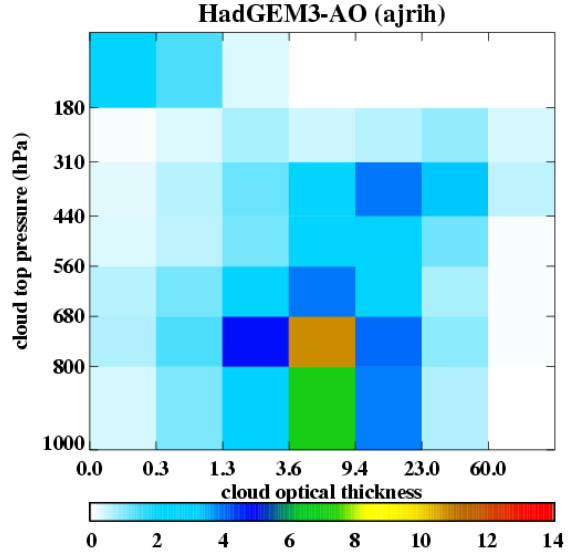




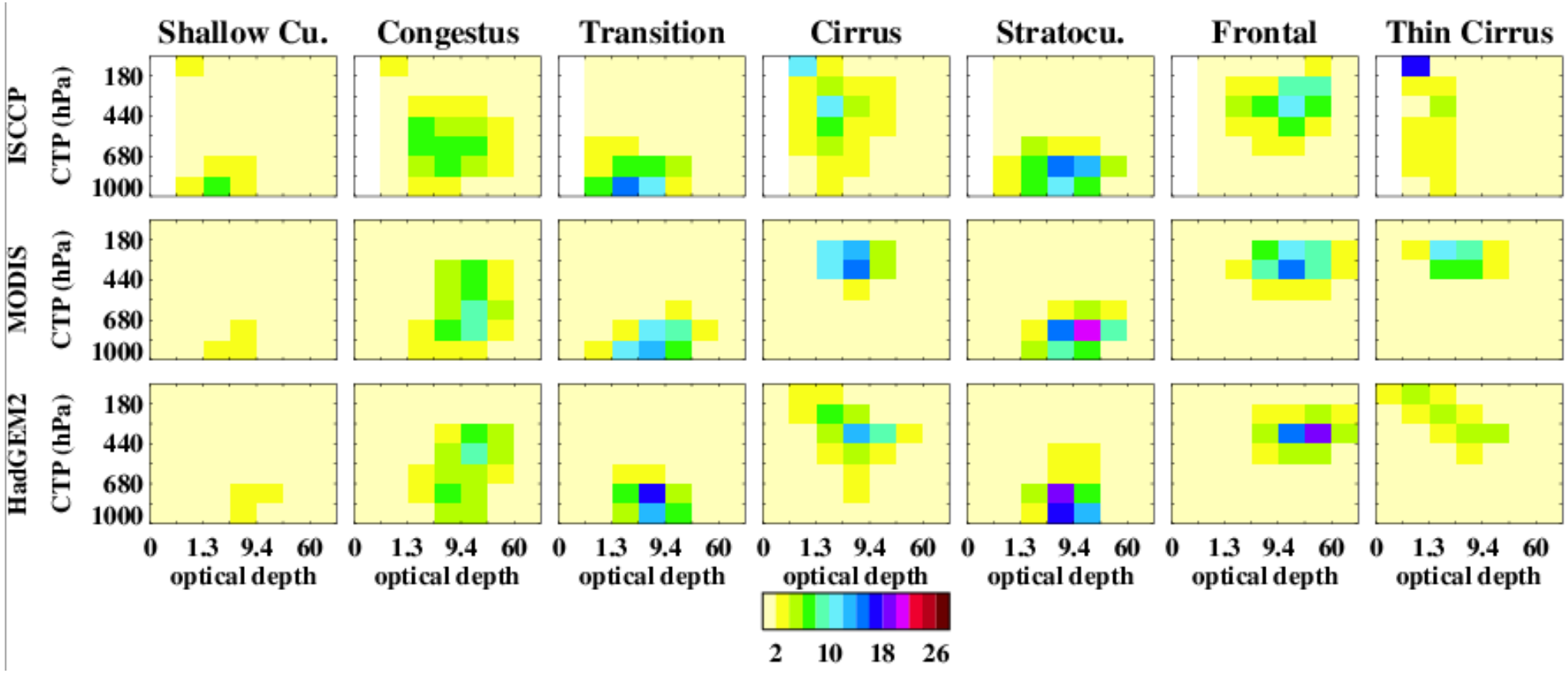








ISCCP histogram clustering



Williams and Webb (2009)

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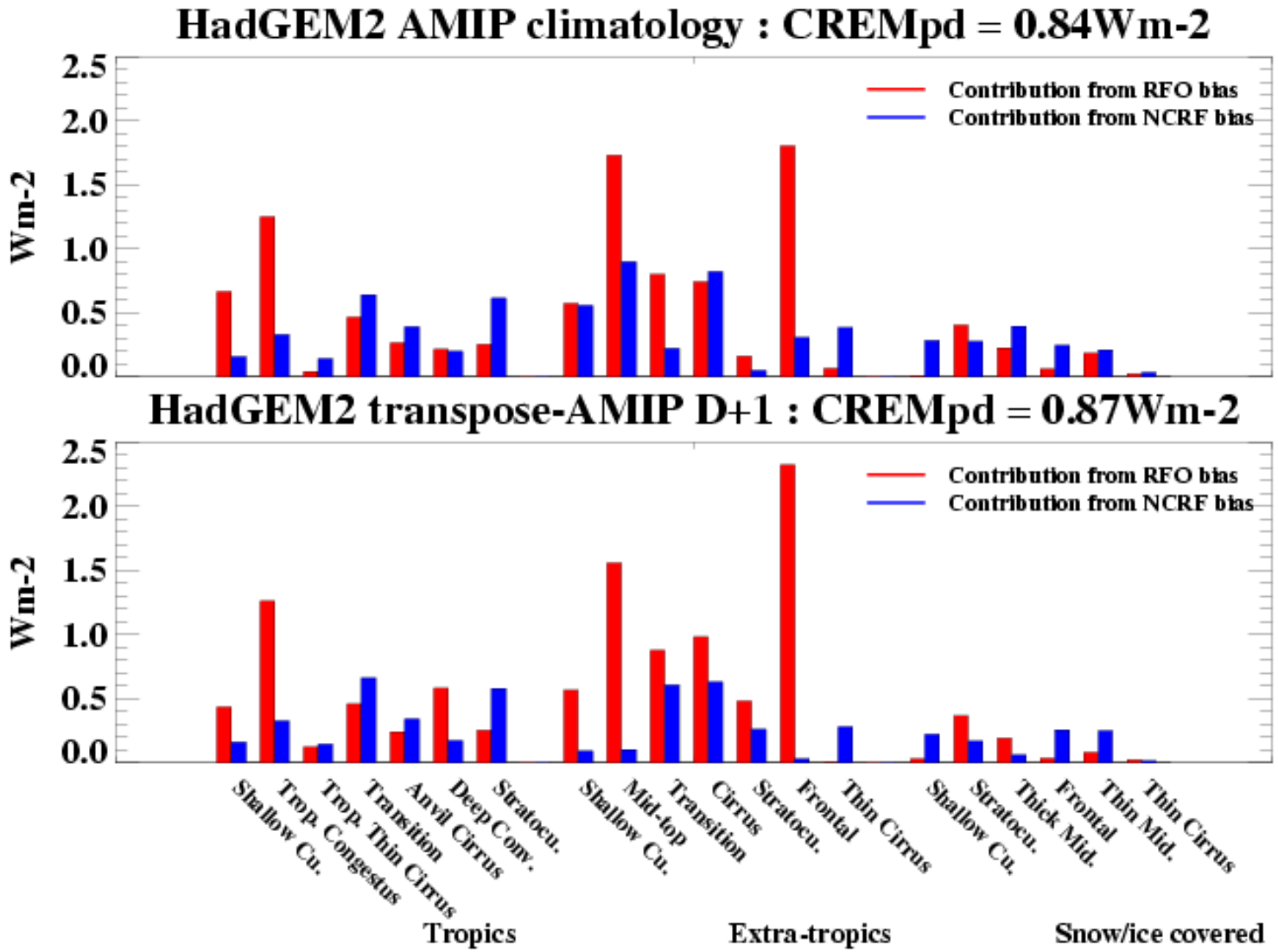
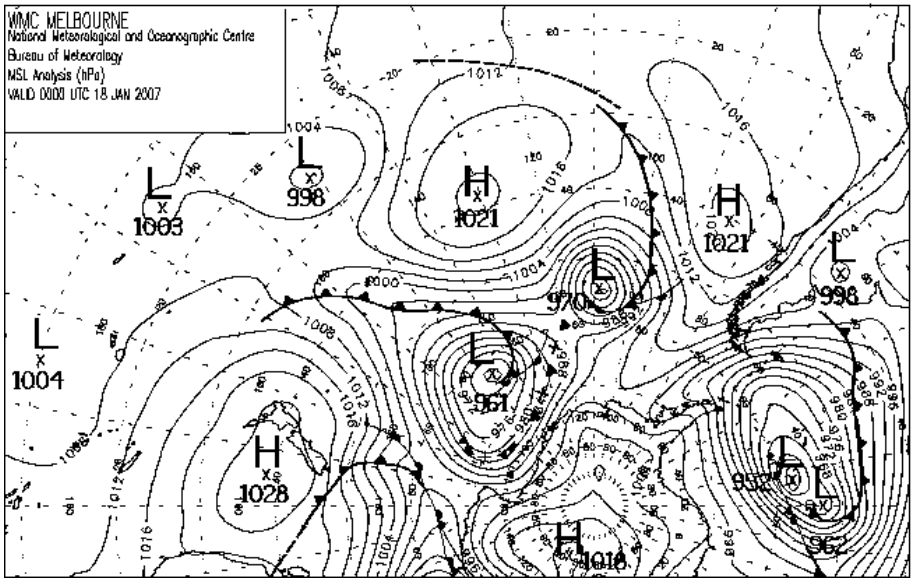
Cloud regime biases apparent within first day

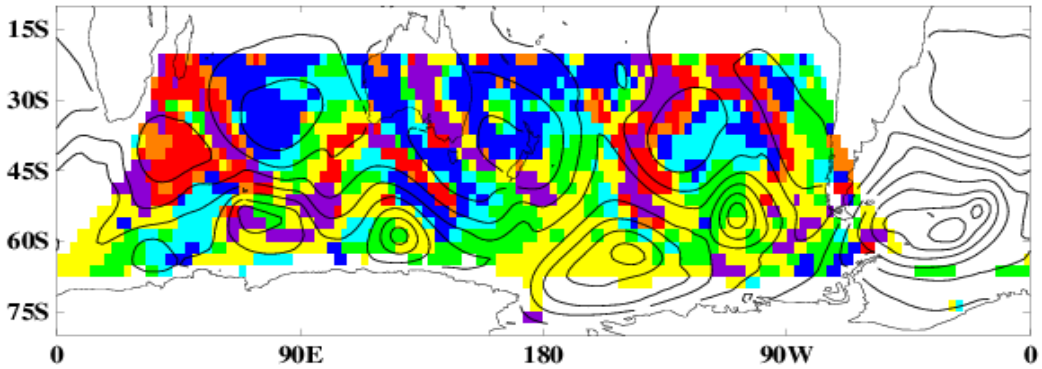


Met Office

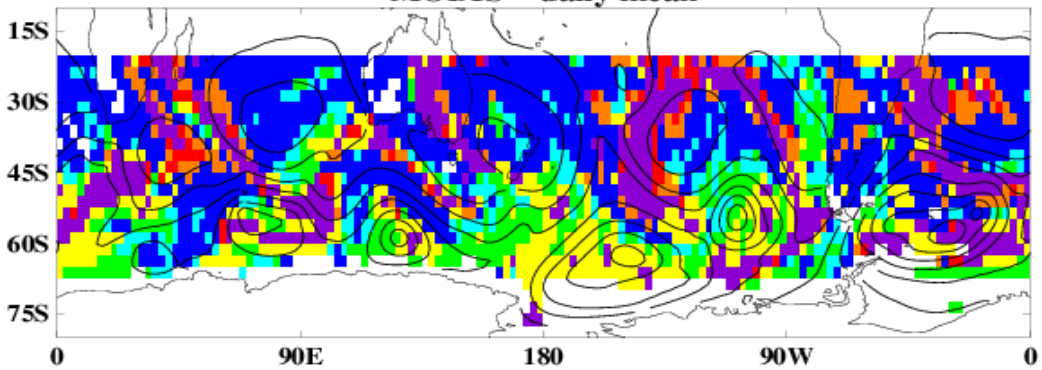
- Clear–sky
- Shallow Cu.
- Transition
- Stratocu.
- Mid–level
- Thin Cirrus
- Cirrus
- Frontal



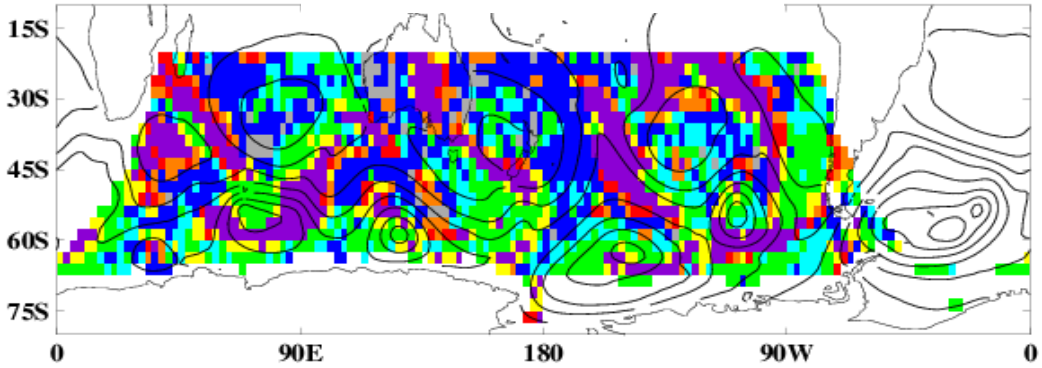
ISCCP



MODIS – daily mean



Model



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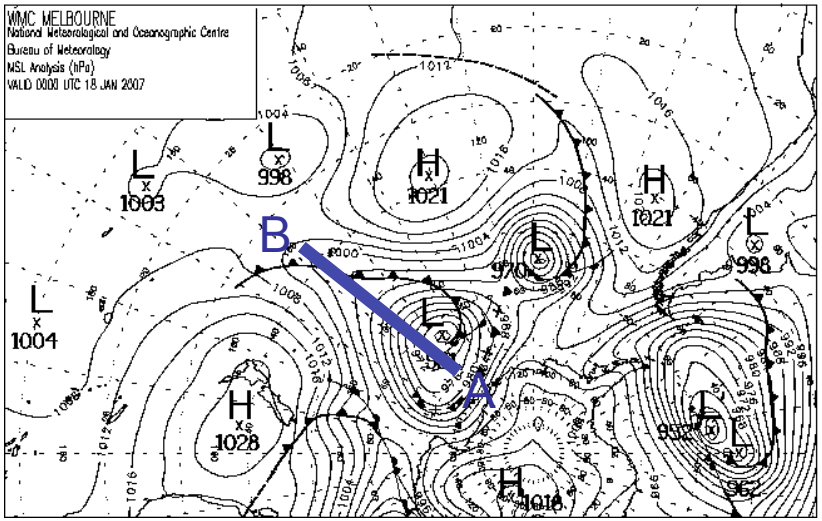
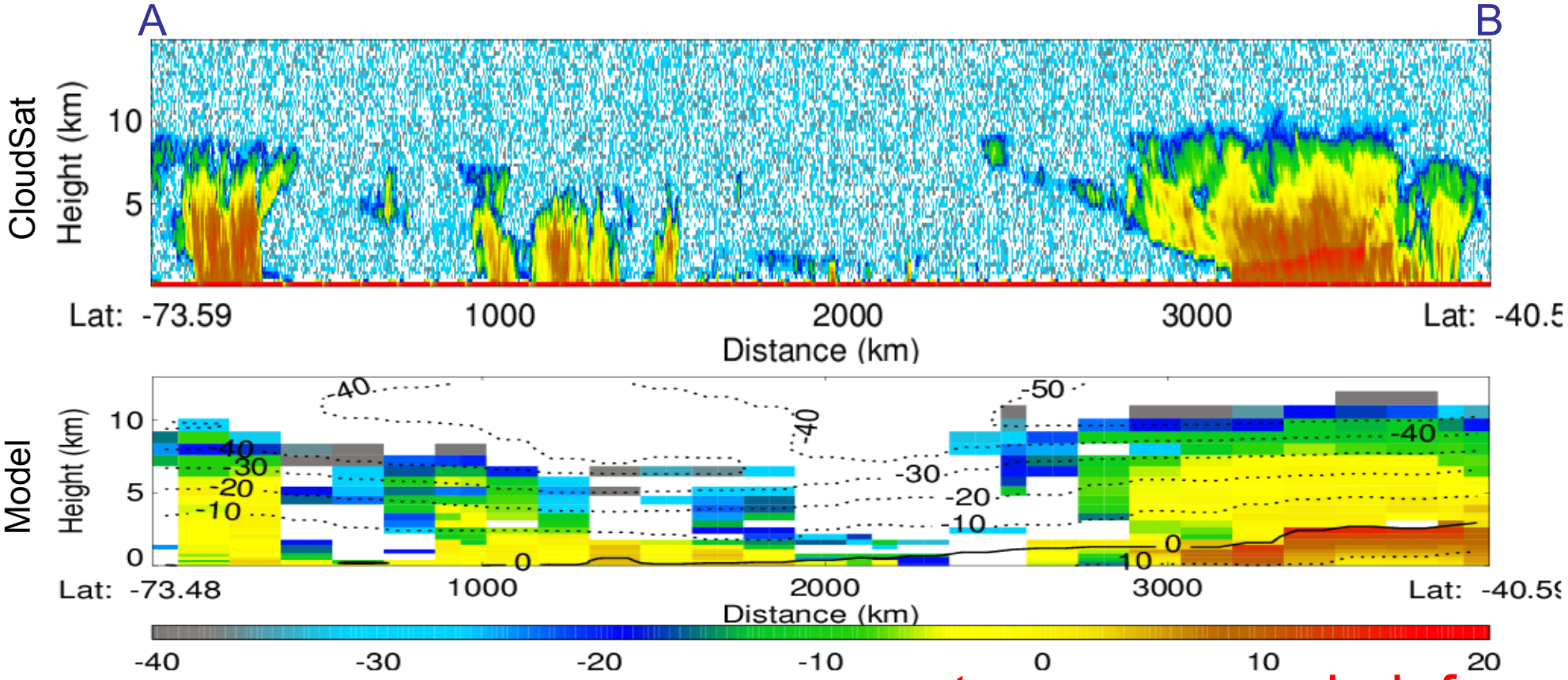
Comparison with CloudSat using COSP





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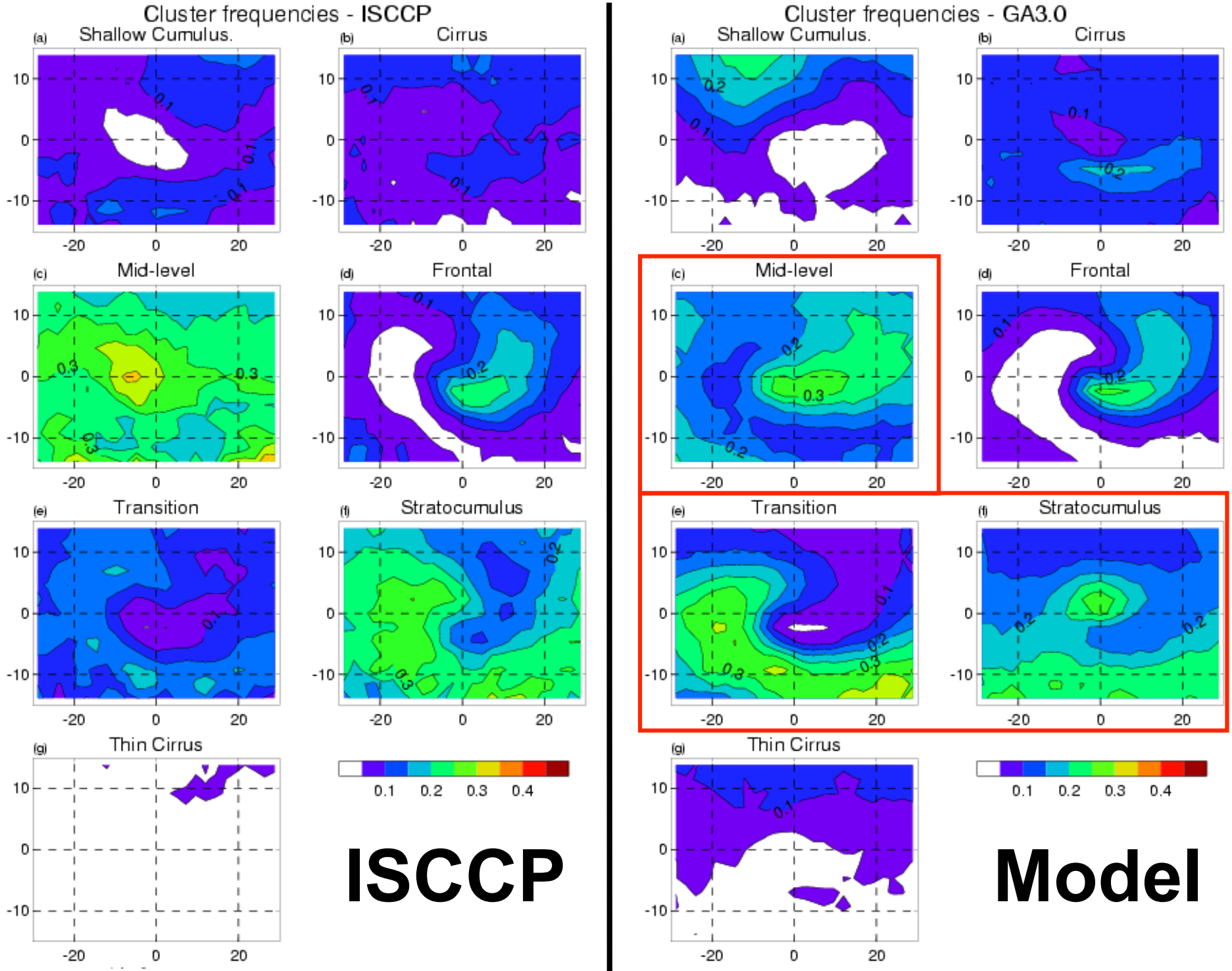
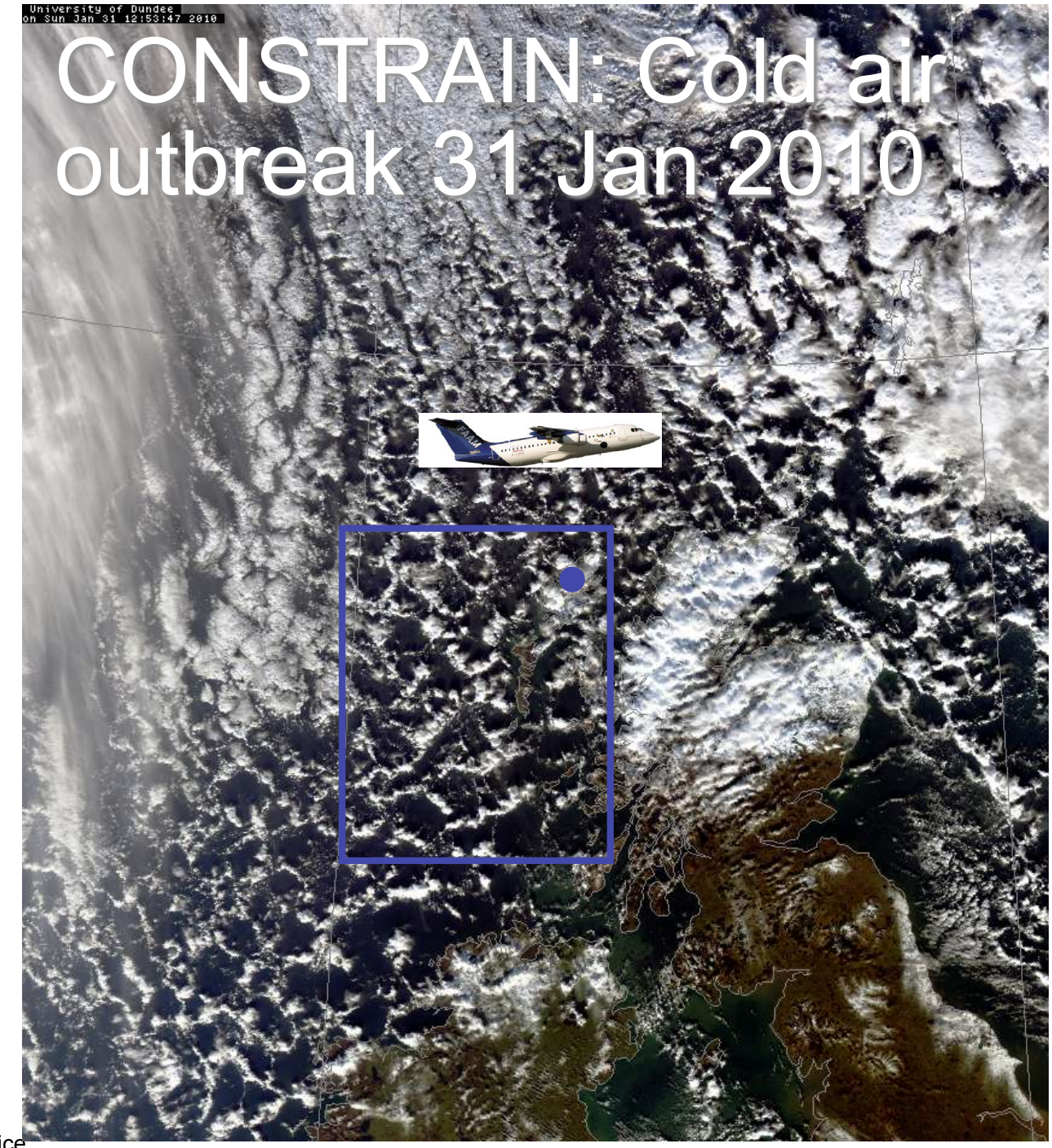
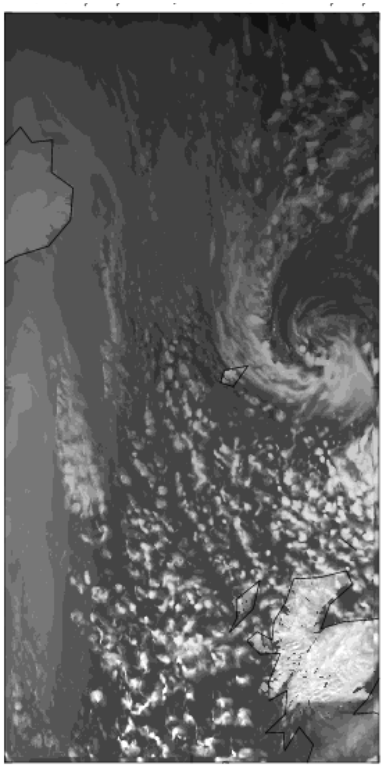
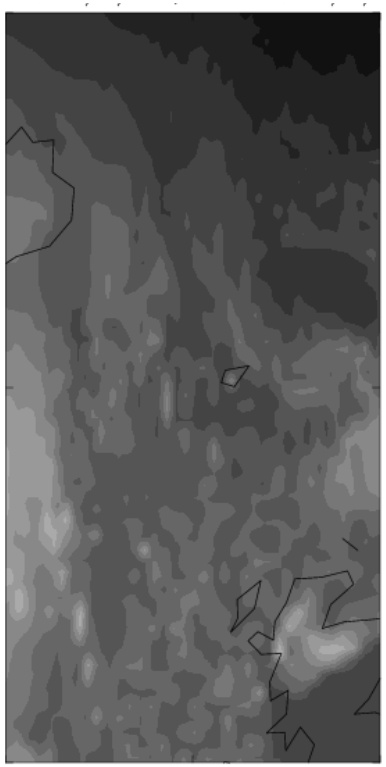

Cluster frequencies - ISCCP
(a) Shallow Cumulus.
(b) Cirrus
(c) Mid-level
(d) Frontal
(e) Transition
(f) Stratocumulus
(g) Thin Cirrus
0.1 0.2 0.3 0.4
ISCCP
Cluster frequencies - GA3.0
(a) Shallow Cumulus.
(b) Cirrus
(c) Mid-level
(d) Frontal
(e) Transition
(f) Stratocumulus
(g) Thin Cirrus
0.1 0.2 0.3 0.4
Model

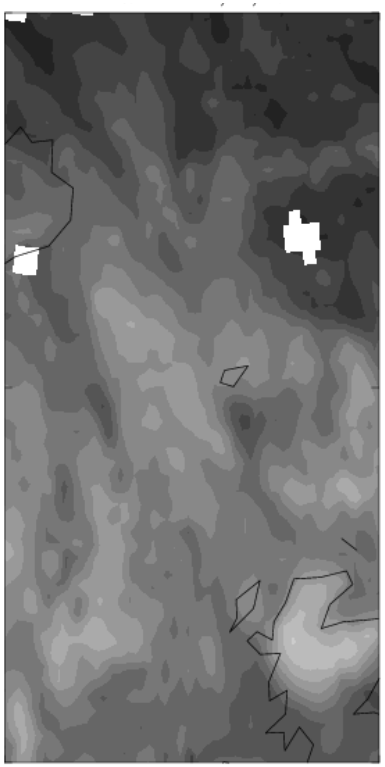
CONSTRAIN: Cold air outbreak 31 Jan 2010

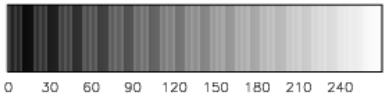


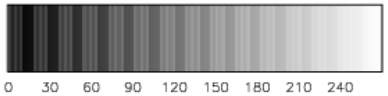
SWtoa

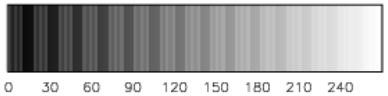












1.5 **Global** **CERES** **MODIS**

(courtesy Rich Allen)

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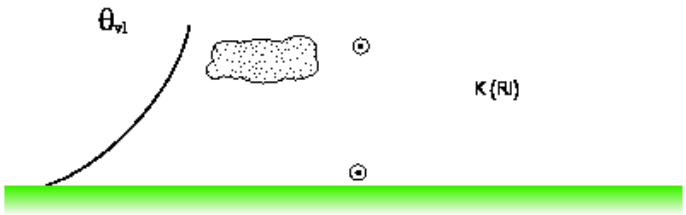
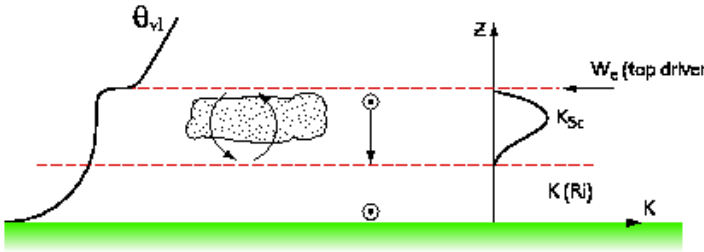
Boundary layer types

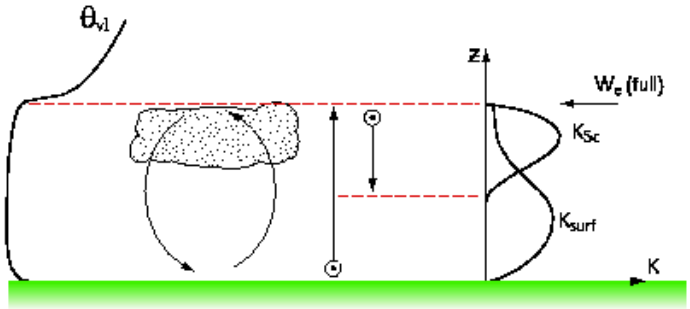
I. Stable boundary layer, possibly with non-turbulent cloud
(no cumulus, no decoupled Sc, stable surface layer)



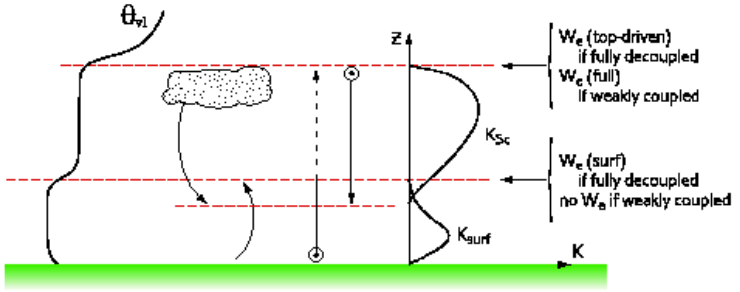
II. Stratocumulus over a stable surface layer
(no cumulus, decoupled Sc, stable surface layer)



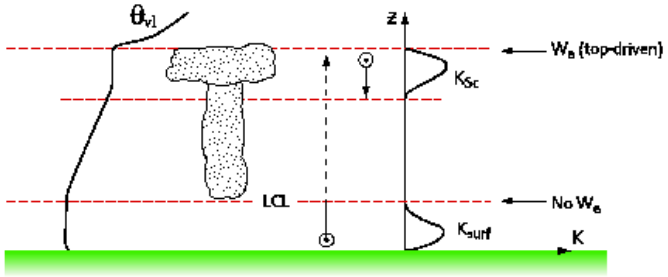
III. Single mixed layer, possibly cloud-topped
(no cumulus, no decoupled Sc, unstable surface layer)



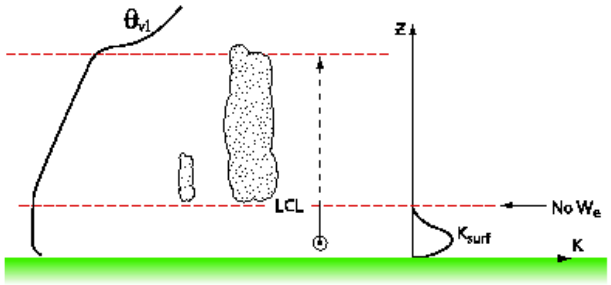
IV. Decoupled stratocumulus not over cumulus
(no cumulus, decoupled Sc, unstable surface layer)



V. Decoupled stratocumulus over cumulus
(cumulus, decoupled Sc, unstable surface layer)

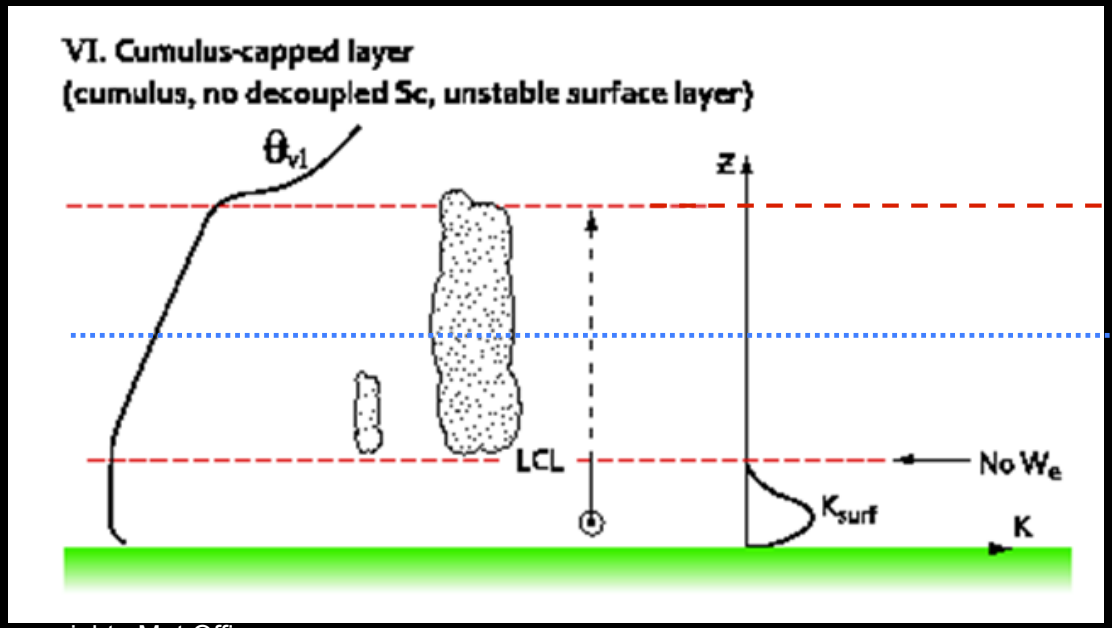


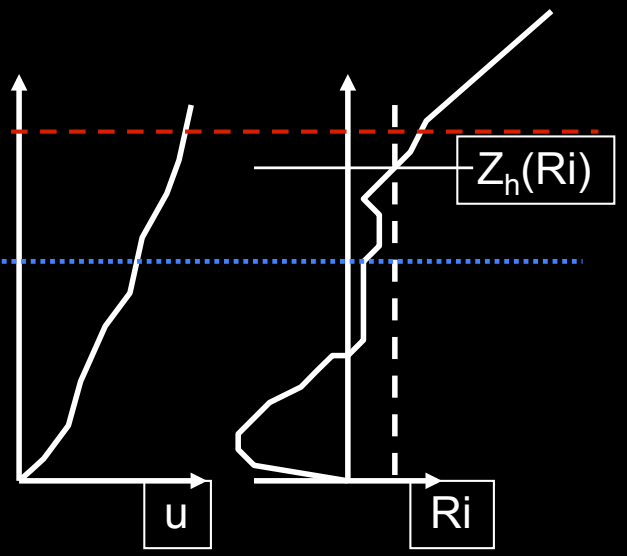
VI. Cumulus-capped layer
(cumulus, no decoupled Sc, unstable surface layer)



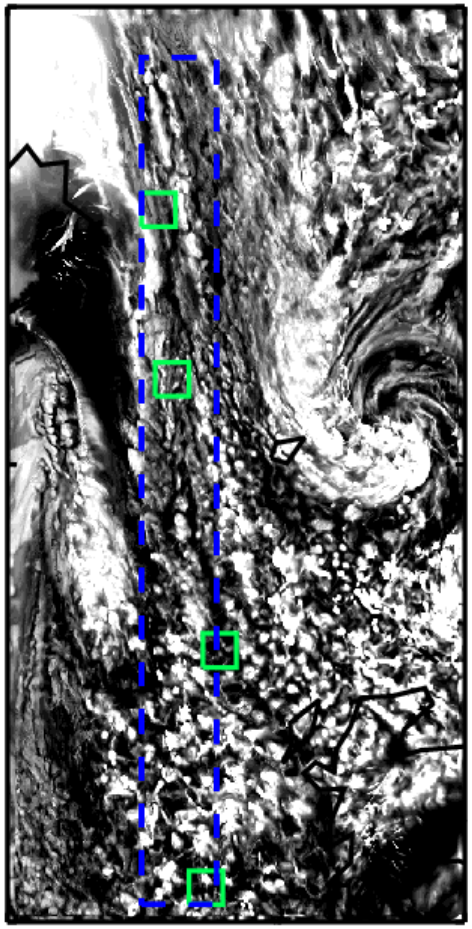
Convective or shear-driven?

- If there is sufficient wind shear that the local BL depth (height where $Ri>Ri_{crit}$) ***exceeds*** the top of the parcel ascent:
  - Set cumulus=false
  - Non-local scheme continues only to mix to the LCL
- Motivated by cold air outbreak work:
  - Trigger when $z_h(Ri) > 0.5(zh_{par}+z_{lcl})$: enough shear to disrupt cumulus formation. Diagnose well-mixed layer to zh_{par}, ie completely undo cumulus diagnosis (becomes BL III)

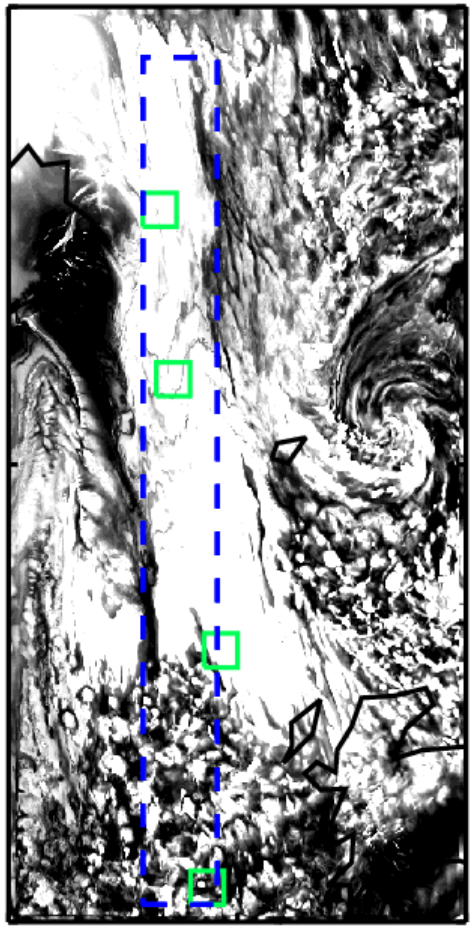


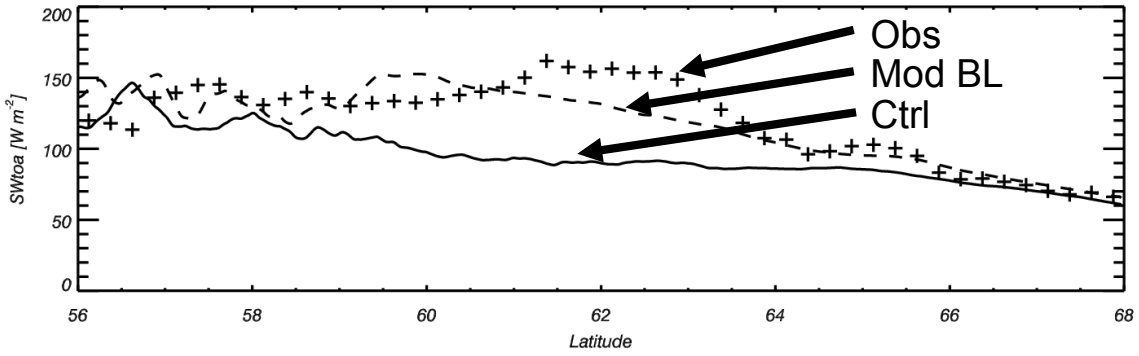


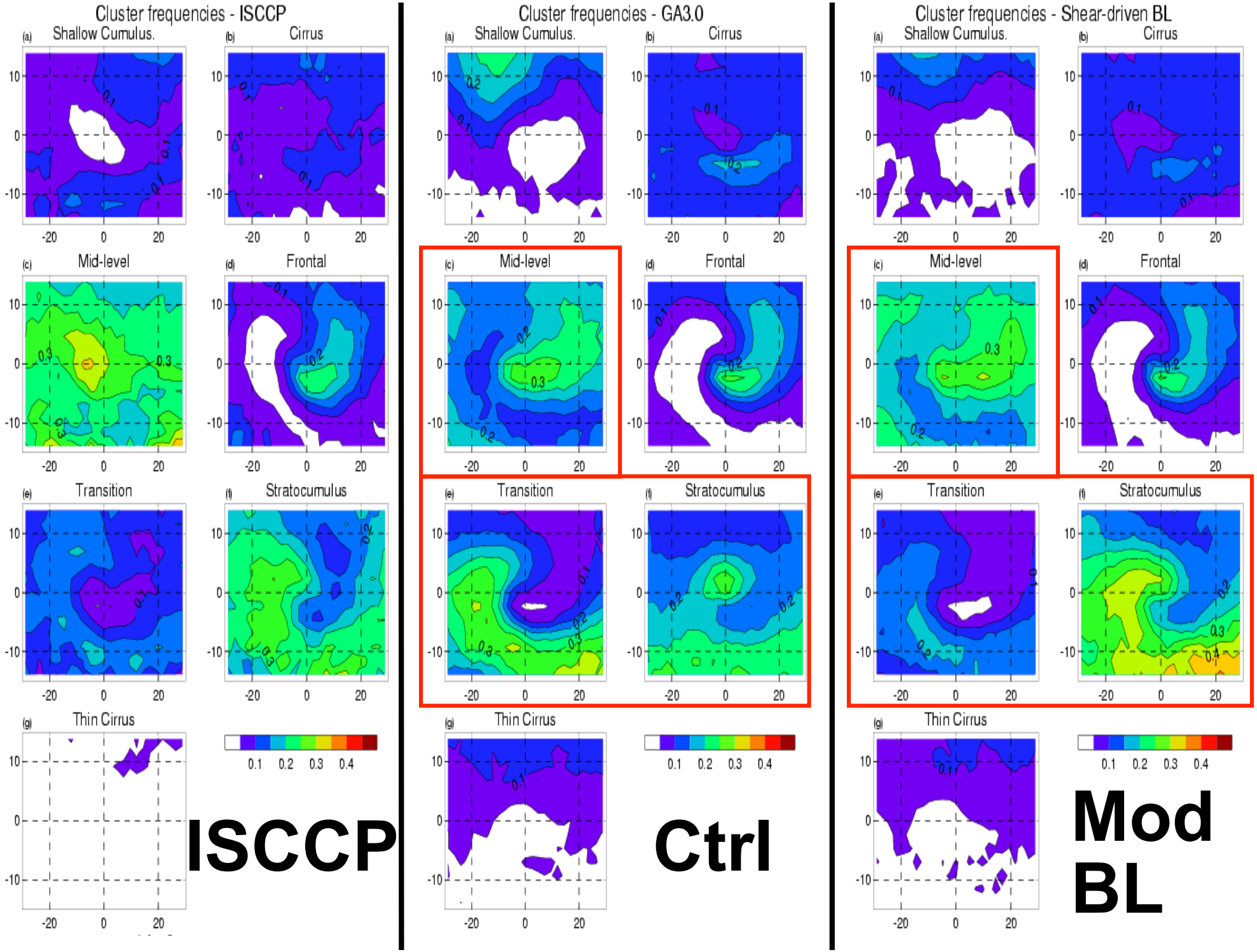
Ctrl Atmos low cloud amount
At 13Z on 31/ 1/2010, from 05Z on 31/ 1/2010



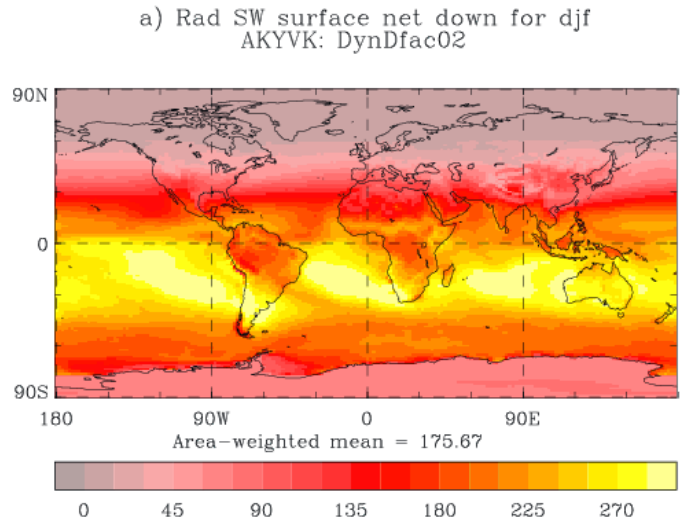
Mod BL Atmos low cloud amount
At 13Z on 31/ 1/2010, from 05Z on 31/ 1/2010

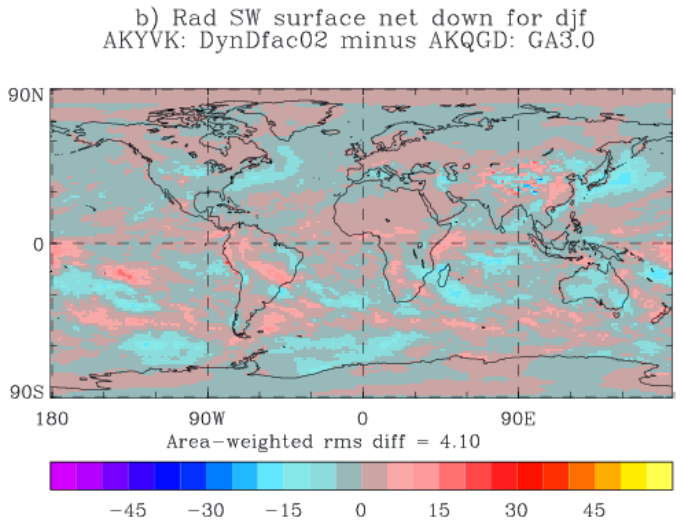





Cluster frequencies - ISCCP
Cluster frequencies - GA3.0
Cluster frequencies - Shear-driven BL
(a) Shallow Cumulus.
(b) Cirrus
(c) Mid-level
(d) Frontal
(e) Transition
(f) Stratocumulus
(g) Thin Cirrus
0.1 0.2 0.3 0.4
ISCCP
Ctrl
Mod BL

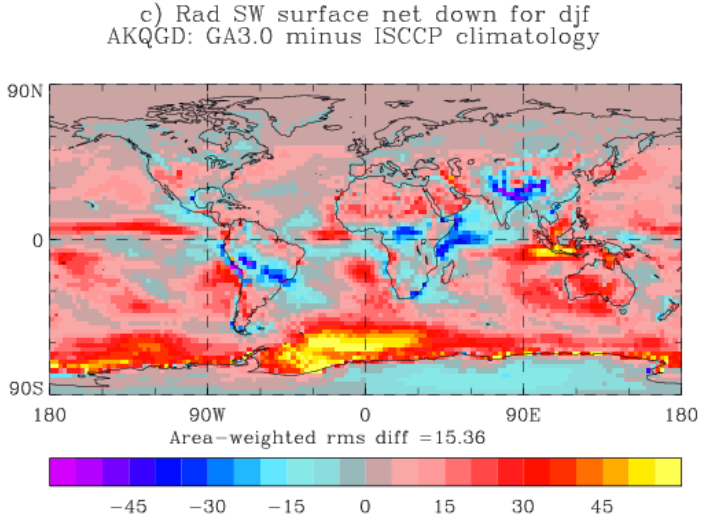
Effect of BL change on surface SW bias

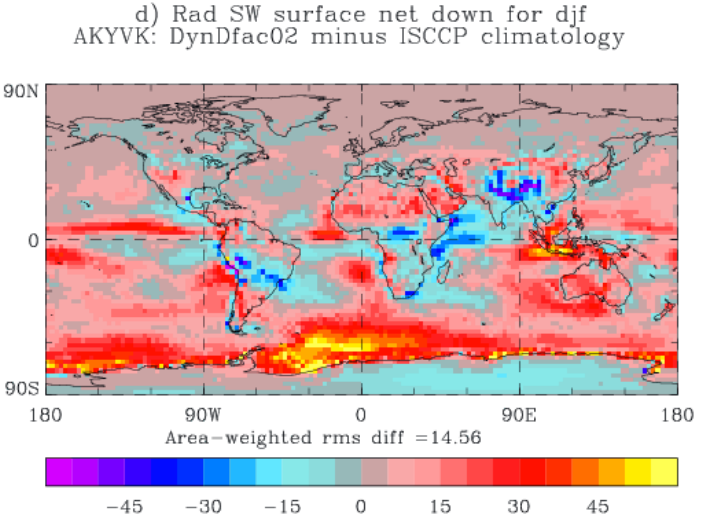




Mod BL minus Ctrl

Ctrl minus obs

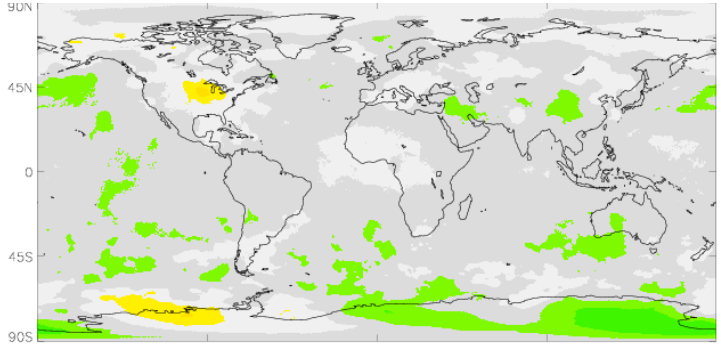




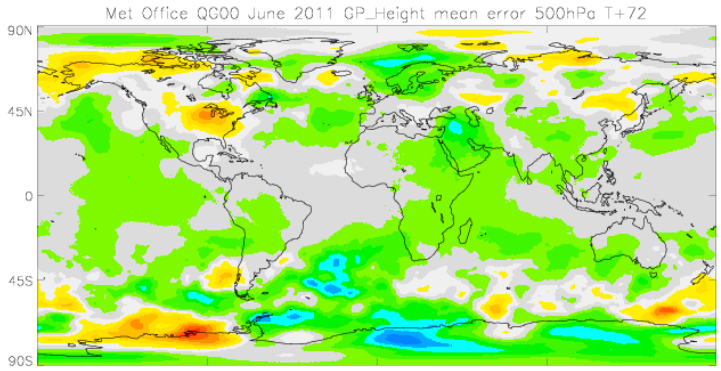
Mod. BL minus obs

Example analysis: US warm bias

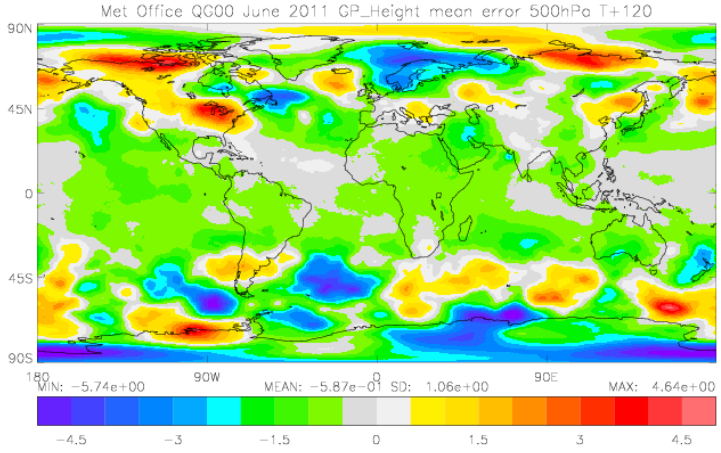
Forecast Z_{500} bias



Day 1

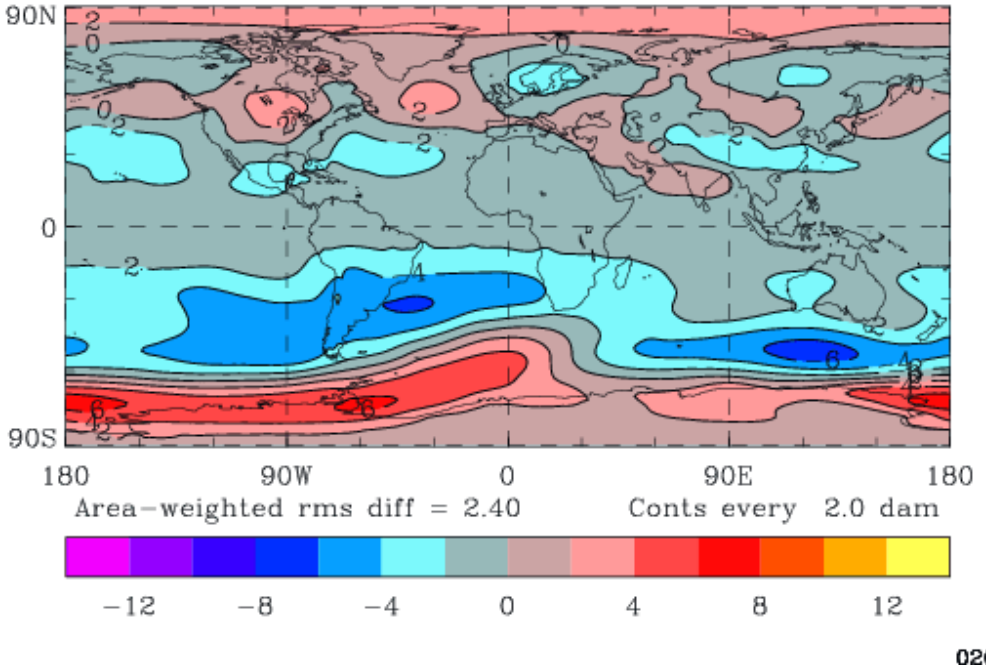


Day 3

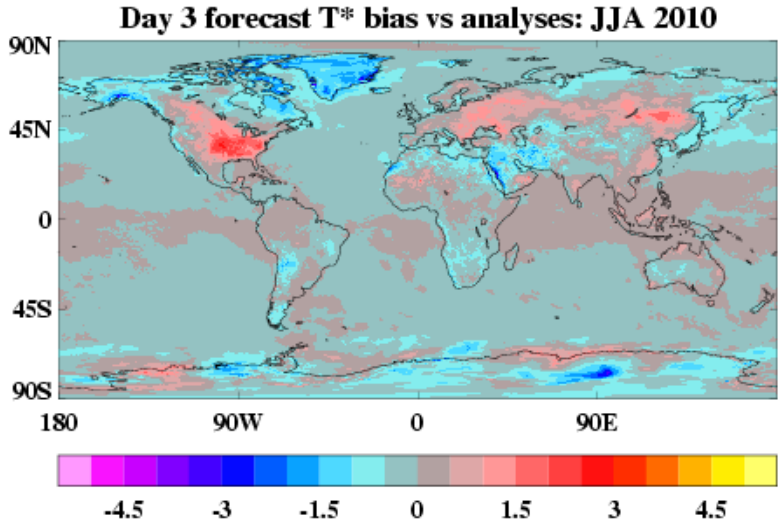


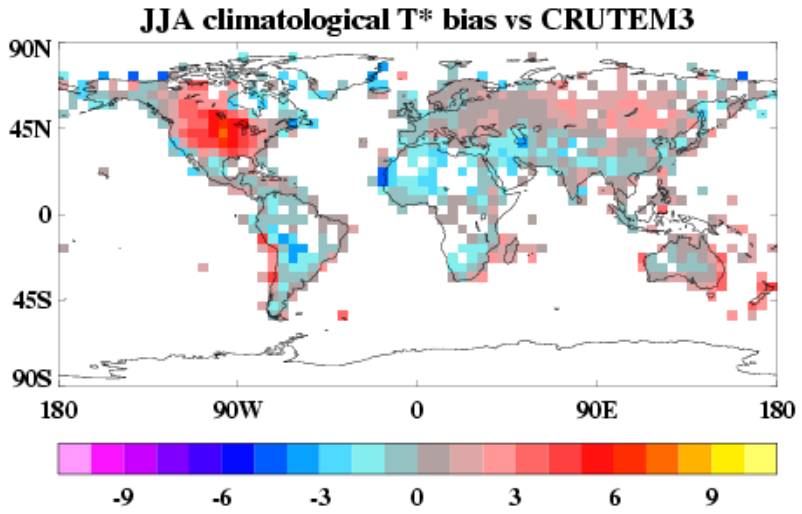
Day 5

JJA Z_{500} bias AMIP climatology

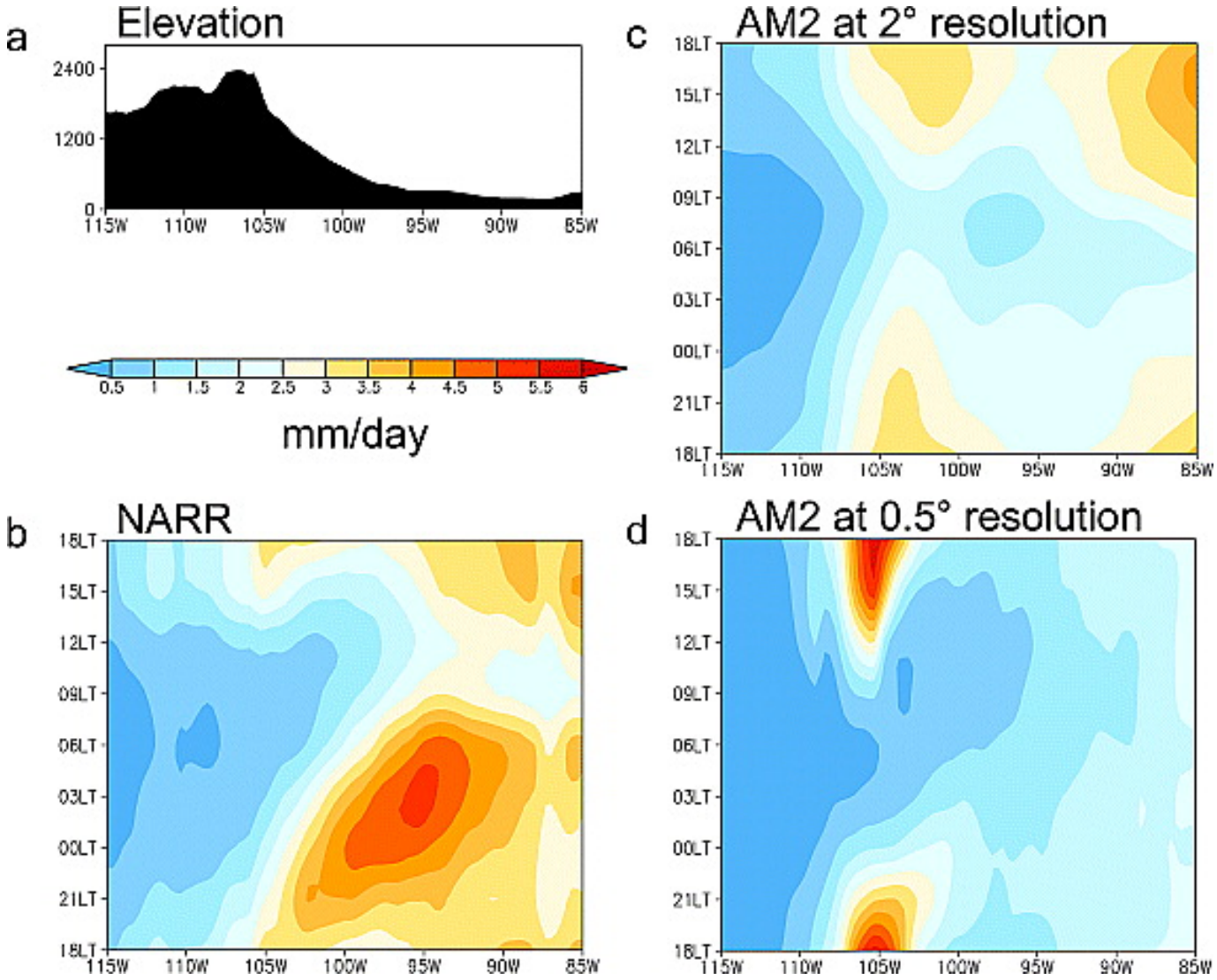


Forecast vs climatological T* bias





Precipitation diurnal Hovmoller



Klein et al (2006)

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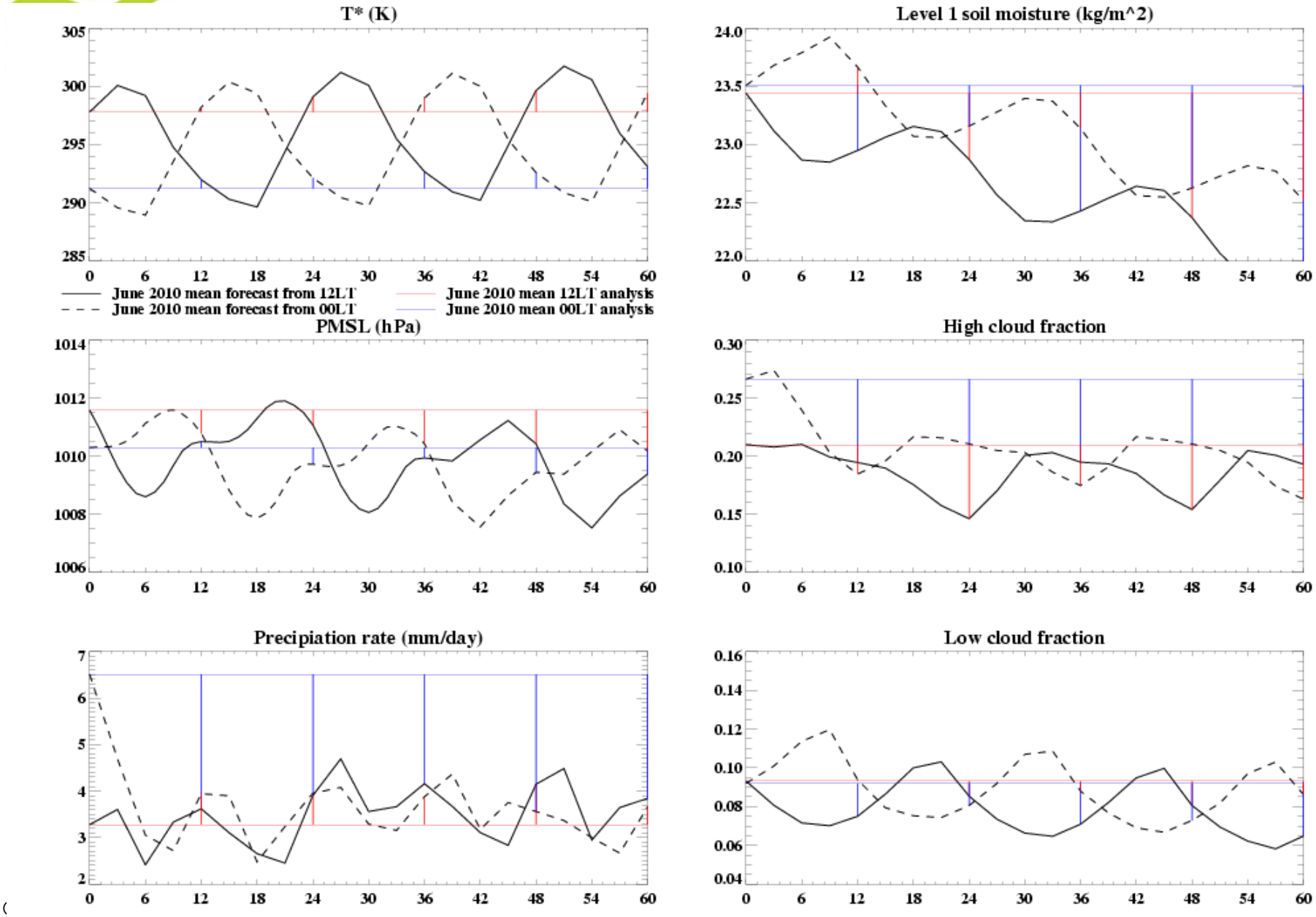
Development of T* bias



Summary

- Transpose-AMIP II data now available to download from the ESG.
- Data from 3 models should be available imminently.
- Others should follow over the next 6 months.
- If your centre has not been listed, please consider conducting the experiment.
- Please start to analyse the data – open to all for research use.

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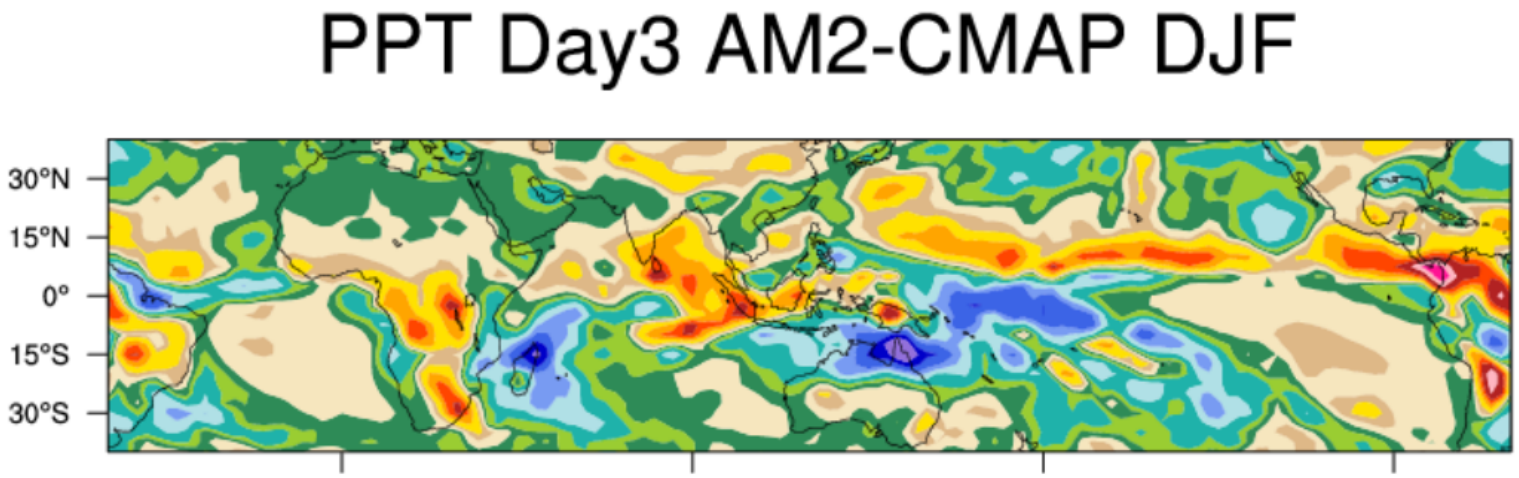
GFDL precipitation biases

Day 3 error



AMIP error

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