GPCI RESULTS to GCSS – DIME – CMAI WEBSITE

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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

GPCI group

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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

GPCI is a working group of the GEWEX Cloud System Study (GCSS) Models and data are analyzed along a Pacific cross-section from stratocumulus, to cumulus and to deep convection.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

GPCI motivation

> To evaluate models and observations in the (sub)tropics in terms of the atmospheric hydrologic cycle.

> To include 3D NWP/Climate models in the GCSS framework (SCM/LES/CRM have limitations).

> To utilize a new generation of satellite datasets (e.g. AIRS, CloudSat, GPS).

> To create a database of models and observations for future studies of the (sub)tropics.
## GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

### GPCI participating models

<table>
<thead>
<tr>
<th>Organization</th>
<th>Model</th>
<th>Type</th>
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<tbody>
<tr>
<td>BMRC (Aus)</td>
<td>BAM 4.0.21</td>
<td>Global</td>
</tr>
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<td>CCC (Can)</td>
<td>CCCma</td>
<td>Global</td>
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<tr>
<td>CMC (Can)</td>
<td>GEM</td>
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<td>CSU/BUGS (US)</td>
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<td>Global</td>
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<td>CSU/MMF (US)</td>
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<td>ECMWF (UK)</td>
<td>ECMWF</td>
<td>Global</td>
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<td>ETH / MPI (Ger)</td>
<td>ECHAM5</td>
<td>Global</td>
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<td>GFDL (US)</td>
<td>AM2p12b</td>
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<td>GKSS (Ger)</td>
<td>CLM</td>
<td>Regional</td>
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<td>JAMSTEC (Jap)</td>
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<td>KNMI (Ned)</td>
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<td>LMD (Fra)</td>
<td>LMDZ4</td>
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<td>MeteoFrance (Fra)</td>
<td>ARPEGE</td>
<td>Global</td>
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<td>NASA/GISS (US)</td>
<td>GISS III 3.3</td>
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<td>NCAR (US)</td>
<td>CAM 3.0</td>
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<td>NCEP (US)</td>
<td>GFS&amp;MOM3</td>
<td>Global Coupled</td>
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<td>NCEP (US)</td>
<td>GFS</td>
<td>Global</td>
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<td>UCLA (US)</td>
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<td>UCSD (US)</td>
<td>RSM</td>
<td>Regional</td>
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<td>UKMO (UK)</td>
<td>HadGAM</td>
<td>Global</td>
</tr>
<tr>
<td>UQM (Can)</td>
<td>CRCM</td>
<td>Regional</td>
</tr>
</tbody>
</table>
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GPCI model data characteristics

Boundary Conditions:
prescribed sea surface temperature.

When?

Time resolution:
0, 3, 6, 9, 12, 15, 18, 21 UTC.

Where?
Eastern (Sub)tropical Pacific.

Cross-section:
13 locations starting at 35 N, 125 W and moving southwestwards at 4 deg longitude and 3 deg latitude steps until 1 S, 173 W.

2D map:
locations every 5x5 degrees within the following grid: latitude from 5 S to 45 N, longitude from 160 E to 120 W.
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Prescribed SST (1998).
Prescribed SST (2003).
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The 13 locations along the cross-section (ISCCP total cloud cover in background).
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JJA 1998 20° N @ 900 hPa

JJA 1998 26° N @ 900 hPa

JJA 1998 32° N @ 900 hPa

JJA 1998 2° N @ 900 hPa

JJA 1998 8° N @ 900 hPa

JJA 1998 14° N @ 900 hPa

900 hPa PBL winds in the cross-section.
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1000 hPa PBL winds in the cross-section.
How representative is the cross-section?

5 N, 190 E

5 N, 195 E

5 N, 200 E

Precipitation histograms from the 2D maps.
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How representative is the cross-section?

20 N, 210 E

20 N, 215 E

20 N, 220 E

Total cloud cover histograms from the 2D maps.
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How representative is the cross-section?

> Results from adjacent points are similar.

> Models are more different.
1998 Results
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JJA 1998 mean vertical profiles. subsidence (Pa/s)
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JJA 1998 mean vertical profiles. subsidence (Pa/s)
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JJA 1998 mean vertical profiles. subsidence (Pa/s)
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JJA 1998 mean vertical profiles. relative humidity (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean vertical profiles. relative humidity (%)
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JJA 1998 mean vertical profiles. relative humidity (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean vertical profiles. cloud liquid water (g/Kg)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

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JJA 1998 mean vertical profiles. cloud liquid water (g/Kg)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean vertical profiles. cloud cover (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean vertical profiles.  cloud cover (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean vertical profiles. cloud cover (%)

JAMSTEC cloud cover (%)

JMA cloud cover (%)

KNMI cloud cover (%)

LMD cloud cover (%)

MeteoFrance cloud cover (%)

NCAR cloud cover (%)

Latitudes: 1720 2326 29 35
Pressures: 1000 900 800 700 600 500 400 300 200 100

Legend: 90 80 70 60 50 40 30 20 10 0
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JJA 1998 mean vertical profiles.  cloud cover (%)
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JJA 1998 mean sections for single-level parameters.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean sections for single-level parameters.
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JJA 1998 mean sections for single-level parameters.

![Graph showing net shortwave radiation at TOA (W/m²) vs. latitude (degrees) for different models and datasets.]
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JJA 1998 mean sections for single-level parameters.
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JJA 1998 mean sections for single-level parameters.
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JJA 1998 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: subsidence.

CSU MMF 08° N subsidence (Pa/s)

CSU MMF 29° N subsidence (Pa/s)

DWD 08° N subsidence (Pa/s)

DWD 29° N subsidence (Pa/s)
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JJA 1998 mean diurnal cycle: subsidence.

ECMWF 08° N subsidence (Pa/s)
solar time

ERA-40 08° N subsidence (Pa/s)
solar time

ECMWF 29° N subsidence (Pa/s)
solar time

ERA-40 29° N subsidence (Pa/s)
solar time
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

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JJA 1998 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: subsidence.

UKMO 08° N subsidence (Pa/s)
solar time

UKMO 29° N subsidence (Pa/s)
solar time

UQM 08° N subsidence (Pa/s)
solar time

UQM 29° N subsidence (Pa/s)
solar time
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: total cloud cover.

**ISCCP**

- total cloud cover (%)
- JJA 1998

**ISCCP pctau VIR blend**

- total cloud cover (%)
- JJA 1998

**OBS:** the plot to the left corresponds to **pctau-IR-only** (VIR=VIS&IR blended).
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JJA 1998 mean diurnal cycle: total cloud cover.
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JJA 1998 mean diurnal cycle: total cloud cover.
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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.

OBS: the plot to the left corresponds to \textit{pctau-IR-only} (\textit{VIR}=VIS&IR blended).
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.
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JJA 1998 mean diurnal cycle: low cloud cover.
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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 mean diurnal cycle: low cloud cover.
Alternative mean low cloud cover:
assume existence of at least 1 sharp gradient of LCC.

OBS: the ISCCP data presented here for the GPCI cross-section comes from the PCTAU dataset
(ftp://gcss-dime.giss.nasa.gov/PACCROSS/PCTAU) and is a blend between VIS&IR.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

Alternative mean low cloud cover: 
assume existence of at least 1 sharp gradient of LCC.

![Graphs showing low cloud cover](image)
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Alternative mean low cloud cover: assume existence of at least 1 sharp gradient of LCC.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

Alternative mean low cloud cover:
assume existence of at least 1 sharp gradient of LCC.
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Alternative mean low cloud cover: assume existence of at least 1 sharp gradient of LCC.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

Alternative mean low cloud cover:
assume existence of at least 1 sharp gradient of LCC.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

Alternative mean low cloud cover: assume existence of at least 1 sharp gradient of LCC.

![Graph showing low cloud cover and its gradient distribution](image)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 histograms of total cloud cover.

**OBS:** the plot to the left corresponds to $\text{pctau VIR} = \text{VIS}\&\text{IR}$ blended.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 histograms of total cloud cover.

**OBS:** the ISCCP data presented here for the GPCI cross-section comes from the ISCCP D1 dataset ([http://gcss-dime.giss.nasa.gov/paccross/browse_dx_paccross.html](http://gcss-dime.giss.nasa.gov/paccross/browse_dx_paccross.html)).
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 1998 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

2003 Results
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. subsidence (Pa/s)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. subsidence (Pa/s)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. subsidence (Pa/s)
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JJA 2003 mean vertical profiles. subsidence (Pa/s)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. relative humidity (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

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JJA 2003 mean vertical profiles. relative humidity (%)
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JJA 2003 mean vertical profiles. cloud liquid water (g/Kg)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles.  cloud liquid water (g/Kg)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. cloud liquid water (g/Kg)
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JJA 2003 mean vertical profiles. cloud liquid water (g/Kg)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. cloud cover (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles.  cloud cover (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. cloud cover (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean vertical profiles. cloud cover (%)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean sections for single-level parameters.

The graph shows the total column water vapour (Kg/m²) as a function of latitude (degrees) for different models, including BMRC, CCC, CMC, CSU BUGS, CSU MMF, DWD, ECMWF, GFDL, GKSS, JAMSTEC, JMA, KNMI, MeteoFrance, NCAR, NCEP, NCEP G&M3, UCLA, UKMO, UQM, LMD, and ERA_AIRS. The graph indicates variations in water vapour across different latitudes, highlighting the diversity in modeled outputs.
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JJA 2003 mean sections for single-level parameters.
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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean sections for single-level parameters.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.

BMRC 08° N subsidence (Pa/s)
solar time

BMRC 29° N subsidence (Pa/s)
solar time

CCC 08° N subsidence (Pa/s)
solar time

CCC 29° N subsidence (Pa/s)
solar time
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.

CSU MMF 08° N subsidence (Pa/s)

CSU MMF 29° N subsidence (Pa/s)

DWD 08° N subsidence (Pa/s)

DWD 29° N subsidence (Pa/s)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.

ECMWF 08° N subsidence (Pa/s)
solar time

ERA_AIRS 08° N subsidence (Pa/s)
solar time

ECMWF 29° N subsidence (Pa/s)
solar time

ERA_AIRS 29° N subsidence (Pa/s)
solar time
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.
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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.

MeteoFrance 08° N subsidence (Pa/s)

MeteoFrance 29° N subsidence (Pa/s)

NCAR 08° N subsidence (Pa/s)

NCAR 29° N subsidence (Pa/s)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: subsidence.

UKMO 08° N subsidence (Pa/s)

UKMO 29° N subsidence (Pa/s)

UQM 08° N subsidence (Pa/s)

UQM 29° N subsidence (Pa/s)
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: total cloud cover.
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JJA 2003 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: low cloud cover.
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GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 mean diurnal cycle: low cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

Alternative mean low cloud cover:
assume existence of at least 1 sharp gradient of LCC.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

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Alternative mean low cloud cover:
assume existence of at least 1 sharp gradient of LCC.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

Alternative mean low cloud cover: assume existence of at least 1 sharp gradient of LCC.
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JJA 2003 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 histograms of total cloud cover.
GCSS/WGNE Pacific Cross-section Intercomparison (GPCI)

JJA 2003 histograms of total cloud cover.
The End