TWP-ICE CRM/SCM/LAM/GCM intercomparison studies: A few lessons learned

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CRMs with periodic BCs are prone to MSE drift (predicted SH and LH fluxes + radiative flux divergence differ variably from VARANAL large-scale forcing) [Fridlind et al., 2012]

—LESSON #1: may be better to simply avoid long (> 7-d) CRM simulations if comparison with tropical observations is a goal (relaxation not popular)
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  —LESSON #1: better to keep CRM simulations short (<several days) if comparison with tropical observations is a goal (SCM-style relaxation unpopular)

• Rigorous CRM-SCM comparison does require identical initialization and BCs [Petch et al., submitted]
  —LESSON #2: if SCM and CRM studies differ in LS forcing and CRM-SCM comparison is a goal, incorporate an identically forced sensitivity test

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Number of models</td>
<td>10</td>
<td>6</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Horizontal domain size</td>
<td>200-300 km²</td>
<td>400-500 km²</td>
<td>Global</td>
<td>One column</td>
</tr>
<tr>
<td>Analysis area</td>
<td>domain</td>
<td>average of grid boxes overlapping with the TWP-ICE variational analysis domain</td>
<td>average of grid boxes overlapping with the TWP-ICE variational analysis domain</td>
<td>1 grid box</td>
</tr>
<tr>
<td>Horizontal grid length (km)</td>
<td>0.9-3</td>
<td>1-3</td>
<td>20-250</td>
<td>25-200</td>
</tr>
<tr>
<td>Vertical grid length around 500 mb (km)</td>
<td>0.18-0.6</td>
<td>0.3-0.5</td>
<td>0.3-1.0</td>
<td>0.3-1.0</td>
</tr>
<tr>
<td>Forecast lead time analysed</td>
<td>Free running for whole period</td>
<td>12 to 36 hours</td>
<td>24 to 48 hours</td>
<td>Free running for whole period</td>
</tr>
<tr>
<td>Forcing</td>
<td>Variational analysis</td>
<td>Nested in global models driven by EC analysis</td>
<td>ECMWF analysis</td>
<td>ECMWF Variational analysis</td>
</tr>
</tbody>
</table>
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  —**LESSON #3**: statistical comparison could have benefits beyond matched spatiotemporal comparison

- GCM/LAM/CRM/SCM comparison would benefit from choosing at least one common theme and a unique set of diagnostics, e.g., stratiform and convective rainfall [Lin et al., 2012]

  —**LESSON #4**: unique diagnostics require run-time calculations that can’t be done after-the-fact, so a clear focus on joint scientific questions *in advance* would be beneficial