Global precipitation products
- Standard quality assessment

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2015 climatology of various global P products

- Zonal mean precipitation over ocean
Questions

1) Where in the algorithm do biases originate from?
   - Different instruments (MW, IR, or Gauge)? Sampling inconsistency? Choice of inversion schemes?
   - A useful exercise is to trace the error propagation across algorithm steps (MW → MW+IR → MW+IR+Gauge).

2) Are currently available precipitation estimates reliable for analyzing the global water/energy budget?
   - A key question relevant to GEWEX/GDAP assessments

3) Can we link the error characteristics in the mean precipitation to those in extremes?

4) Can we exploit the structural error characteristics (regionality, ENSO signals, ...) for tracking down the sources of errors?

5) Are the global products with reasonable rain estimates reliable also for solid precipitation?

6) How can we prioritize the issues as listed above to best meet the needs of operational users?
Evolution of P estimates across algorithm steps

- IMERG (top) and GSMaP (btm): IR-MW (left) and Ga-IR (right)
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E, P and Div(Q) from GPCP/SeaFlux and ERA

Tropical Indian Ocean

\[ E - P = \nabla \cdot Q \]
E, P and Div(Q) from GPCP/SeaFlux and ERA

- Tropical West Pacific

\[ E - P = \nabla \cdot Q \]

\(~30 \text{ W/m}^2\) bias
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Interannual variability

- ENSO and rainfall biases

![Graph showing inter-annual variability in TRMM and GPCP (30S-30N)]

<table>
<thead>
<tr>
<th>Percent Change in Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRMM TMI</td>
</tr>
<tr>
<td>TRMM PR</td>
</tr>
<tr>
<td>GPCP</td>
</tr>
</tbody>
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- TRMM 3A25 V7
- TRMM 3A12 V7
- GPCP V2.2
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Appendix
A Water Budget Closure Test

\[ E - P = \nabla \cdot Q \]