Conclusions

How do we improve repeatability?
## Reflectance-based uncertainty

<table>
<thead>
<tr>
<th>Source Descriptor</th>
<th>Top-of-atmos. Radiance % uncert.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground reflectance measurement</td>
<td>2.2</td>
</tr>
<tr>
<td>Optical depth measurements</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Absorption computations</td>
<td>---</td>
</tr>
<tr>
<td>Aerosol complex index (aerosol composition)</td>
<td>0.5</td>
</tr>
<tr>
<td>Aerosol size distribution</td>
<td>0.3</td>
</tr>
<tr>
<td>Non-lambertian ground characteristics</td>
<td>---</td>
</tr>
<tr>
<td>Vertical distribution</td>
<td>---</td>
</tr>
<tr>
<td>Non-polarization versus polarization</td>
<td>0.1</td>
</tr>
<tr>
<td>Radiative transfer code uncertainty</td>
<td>1.0</td>
</tr>
<tr>
<td>Uncertainty in solar zenith angle</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>TOTAL ROOT SUM SQUARE (RSS) ERROR</strong></td>
<td><strong>2.5</strong></td>
</tr>
</tbody>
</table>
Reflectance is dominant
Improving the surface reflectance repeatability is the first step to improving overall uncertainty.

- Lower relative uncertainties will make it easier to decouple effects in the other terms.
- More frequent reference measurements.
- Better repeatability of reference measurements.
- Better angular repeatability of field spectrometer view.
Aerosols still matter

For western US desert sites, the aerosols absorption and directional scatter contribute

- Aerosol complex index (aerosol composition) - 0.5%
- Aerosol size distribution - 0.3%
- Careful solar radiometer calibration
- Inclusion of diffuse sky irradiance
  - Helps define absorption
  - Give information about representativeness of a given date
- Inclusion of directional sky radiance
  - Give indication whether the Junge parameter is a good assumption
  - Can search for dates that are replicated in size distribution
- Use of the same radiative transfer code
Inclusion of sky radiance and downwelling sky radiance should help repeatability

Aerosols still matter