Blending Different Soil Moisture Products over Tibetan Plateau and its Validation

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OUTLINE

- Tibetan Plateau SM & ST Observatory
- Assessment of ECMWF Land Surface Analysis Over TP
- Blending SM Product Over Tibetan-Plateau
In-Situ Soil Moisture Observations

Tibetan Plateau Observatory

Su Z. et al. 2011, HESS
**Results:** Soil moisture from a) the ECMWF pervious operational run (ECMWF-Oper-OI, where the SM analysis uses the Optimal Interpolation method) and b) the ECMWF-HSAF numerical experiment (using the EKF soil moisture analysis with ASCAT data assimilation), compared to in-situ measured soil moisture in the Naqu network area.

\[ R_{OI,1st} = 0.918 \]
\[ R_{OI,2st} = 0.722 \]
\[ R_{EKF,1st} = 0.913 \]
\[ R_{EKF,2st} = 0.55 \]
Assessment of ECMWF land surface analysis over TP (Naqu)

<table>
<thead>
<tr>
<th></th>
<th>Saturation (m$^3$ m$^-3$)</th>
<th>Wilting Point (m$^3$ m$^-3$)</th>
<th>Field Cap. (m$^3$ m$^-3$)</th>
<th>Ks (m d$^-1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maqu-ECMWF</td>
<td>0.43</td>
<td>0.13</td>
<td>0.38</td>
<td>0.047</td>
</tr>
<tr>
<td>Maqu-In-situ</td>
<td>0.44</td>
<td>0.058</td>
<td>0.11</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Su Z. et al. 2013, JGR, under review
Assessment of SM Satellite data over TP (Maqu Network)

Su Z. et al. 2011, HESS
Blending SM Product over Tibetan-Plateau: Bayesian

\[ SM_{AMSR-E} = \alpha SM_{in situ} + \varepsilon_{AMSR-E} \]

\[ SM_{ASCAT} = \alpha SM_{in situ} + \varepsilon_{ASCAT} \]

\[ \omega_{AMSR-E} = \frac{1}{\sigma_{AMSR-E}^2 + \frac{1}{2000\sigma_{ASCAT}^2}} \]

\[ \omega_{ASCAT} = \frac{1}{\sigma_{ASCAT}^2} \left( \frac{1}{\sigma_{AMSR-E}^2} + \frac{1}{\sigma_{ASCAT}^2} \right) \]
Blending SM Product over Tibetan-Plateau: Preliminary
Blending SM Product over Tibetan-Plateau: Preliminary
Blending SM Product over Tibetan-Plateau: Comparison

(Su Z., in preparation)
Blending SM Product over Tibetan-Plateau: Challenges

Tibetan Plateau Observatory

Variational Bias Correction?

<table>
<thead>
<tr>
<th>Season</th>
<th>ASCAT</th>
<th>AMSR-E Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. - Apr. (Transition 1)</td>
<td>-0.0081</td>
<td>0.0233 m³ m⁻³</td>
</tr>
<tr>
<td>May - Sep. (Monsoon)</td>
<td>0.0189</td>
<td>-0.0005 m³ m⁻³</td>
</tr>
<tr>
<td>Oct. - Nov. (Transition 2)</td>
<td>-0.0238</td>
<td>0.033 m³ m⁻³</td>
</tr>
<tr>
<td>Dec. - Feb. (Winter)</td>
<td>-0.1037</td>
<td>0.0821 m³ m⁻³</td>
</tr>
</tbody>
</table>
Blending SM Product over Tibetan-Plateau: Comparison
CONCLUSIONS

- The use of reanalysis data should be checked by using ground “truth”, to understand the difference;

- The comparison between the multi-sensor data with the in-situ soil moisture measurement indicates the need for generating one consistent set of soil moisture product.

- Blending approach is useful, however the data climatology needs to be tuned;
Thanks for your attention!

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