Modifying the Aquarius Galaxy Model

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The Aquarius galaxy model is a fairly complex model
• An antenna integration over a rough ocean surface
• Based on David’s and Emmanuel astronomy map

SMAP dual fore and aft looks provide the means to directly determine the galaxy map for SMAP

Orbits 864 to 5718, about 1 year of data

Case 1: Average over all winds
Case 2: Winds below 5 m/s
Method for Finding Galaxy TA from SMAP Dual Looks

\[
T_A = T_{A0} + T_{A,galaxy}(\phi) + T_{A,rough}(\phi_w - \phi) + T_{A,sun}(\phi)
\]

Avoid areas where sun contribution may be significant

\[
T_{A,galaxy}(\phi_{fore}) - T_{A,galaxy}(\phi_{aft}) = T_A(\phi_{fore}) - T_A(\phi_{aft}) - \left[T_{A,rough}(\phi_w - \phi_{fore}) - T_{A,rough}(\phi_w - \phi_{aft})\right]
\]

If the galaxy model says \(T_{A,aft}\) is small (< 2 K), then assume it is correct

\[
T_{A,galaxy}(\phi_{fore}) = T_A(\phi_{fore}) - T_A(\phi_{aft}) - \left[T_{A,rough}(\phi_w - \phi_{fore}) - T_{A,rough}(\phi_w - \phi_{aft})\right] + T_{A,galaxy}(\phi_{aft})
\]

Likewise if the galaxy model says \(T_{A,fore}\) is small (< 2 K), then assume it is correct

\[
T_{A,galaxy}(\phi_{aft}) = T_A(\phi_{aft}) - T_A(\phi_{fore}) - \left[T_{A,rough}(\phi_w - \phi_{aft}) - T_{A,rough}(\phi_w - \phi_{fore})\right] + T_{A,galaxy}(\phi_{fore})
\]
Current Galaxy Model, all winds
Current Galaxy Model, 2 m/s added to wind speed
Current Galaxy Model, 2 m/s added to wind speed, 10% increase to peak
SMAP-derived Model minus Current Galaxy Model with 2m/s added
SMAP-derived Model minus Galaxy Model with 2 m/s added and peak is scaled
Current Galaxy Model, Wind < 5 m/s
SMAP-derived Model minus Current Galaxy Model, Wind < 5 m/s
SMAP-derived Model minus Galaxy Model with 2 m/s added and peak is scaled

Wind < 5 m/s
Work To Be Done Next 2 Months

• Assess impact of SMAP versus Aquarius Antenna Patterns
  • Is problem due to Antenna Pattern, or
  • Is it due to scattering model

• Fine Tune the Modification

• Implement into Aquarius Test Bed

• Symmetrize Galaxy Correction

• Assess Improvement