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Modifying the Aquarius Galaxy Model

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Aquarius Calibration Workshop
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Santa Rosa, CA

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_{Aaft} 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_{Afore} is small (< 2 K), then assume it is correct

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

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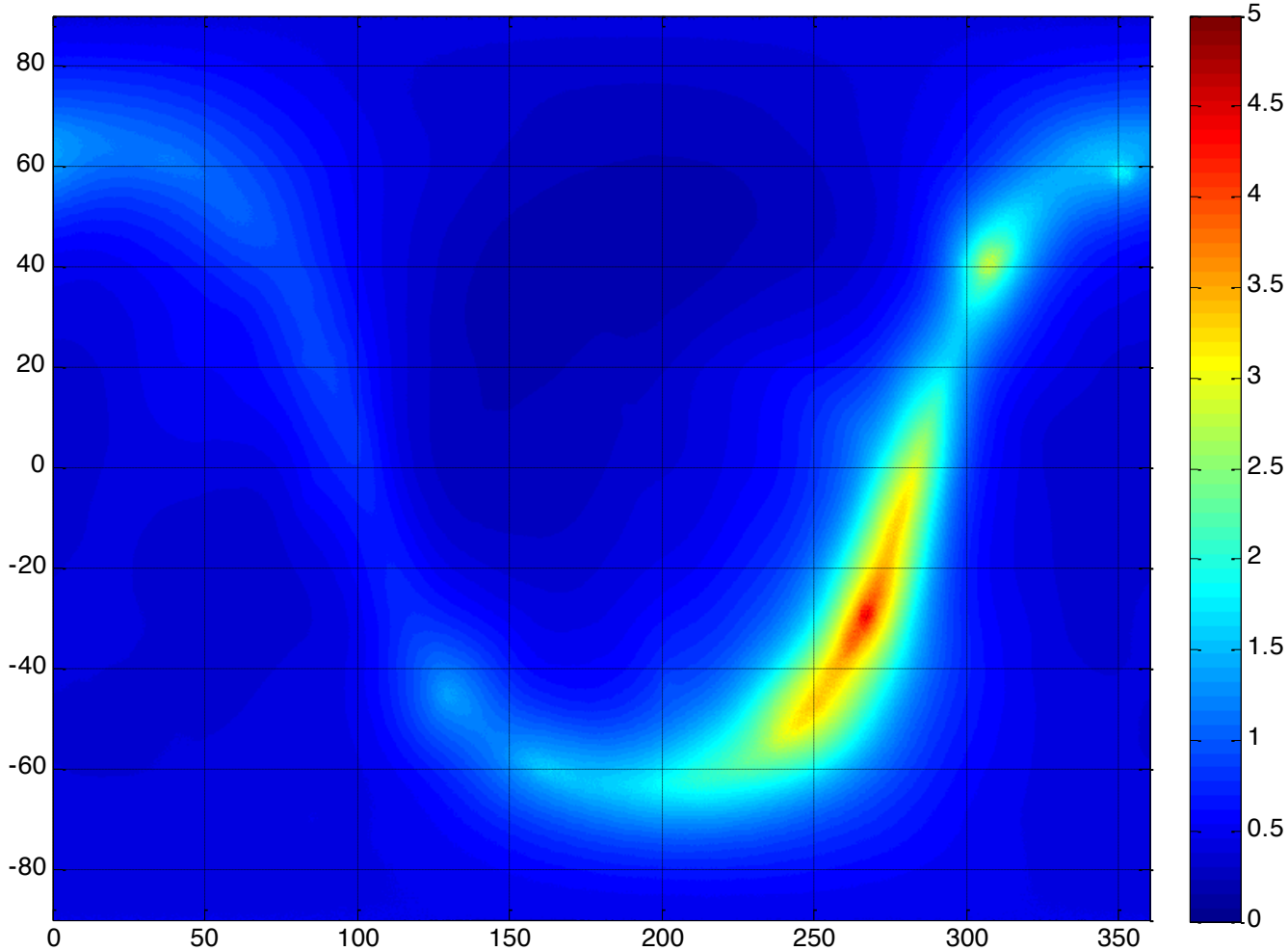
Current Galaxy Model, all winds



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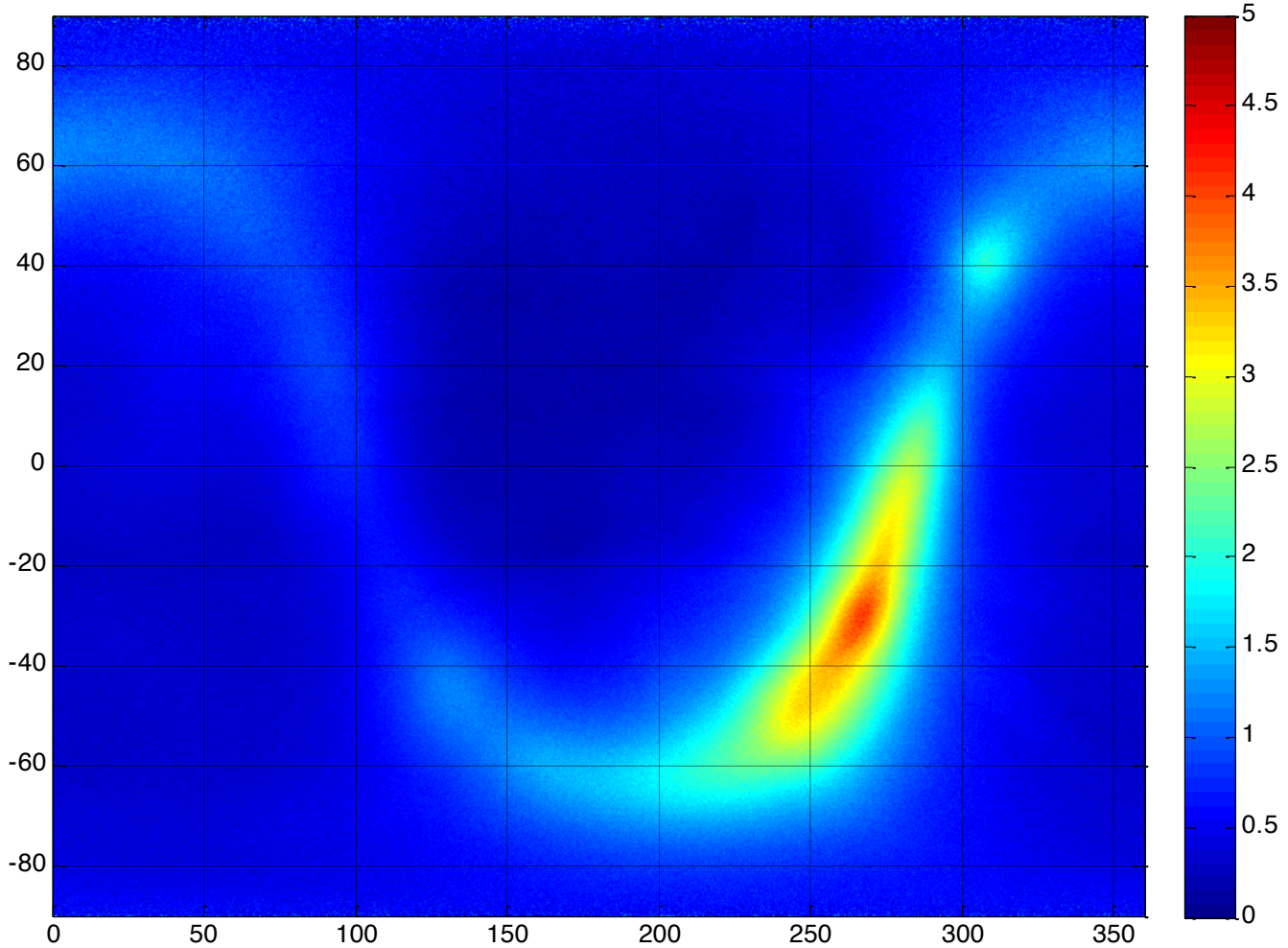
Galaxy Model derived from SMAP, all winds



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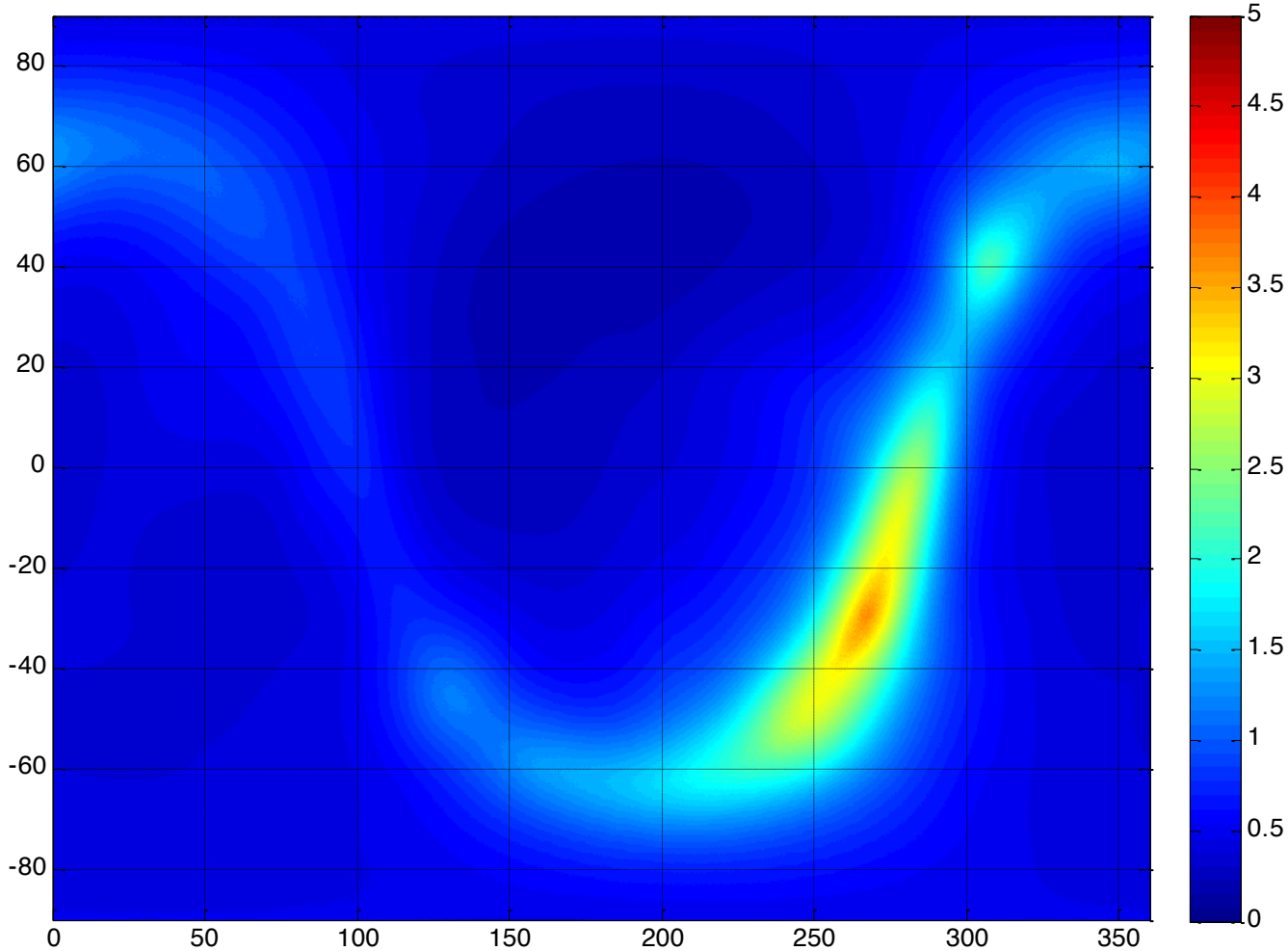
Current Galaxy Model, 2 m/s added to wind speed



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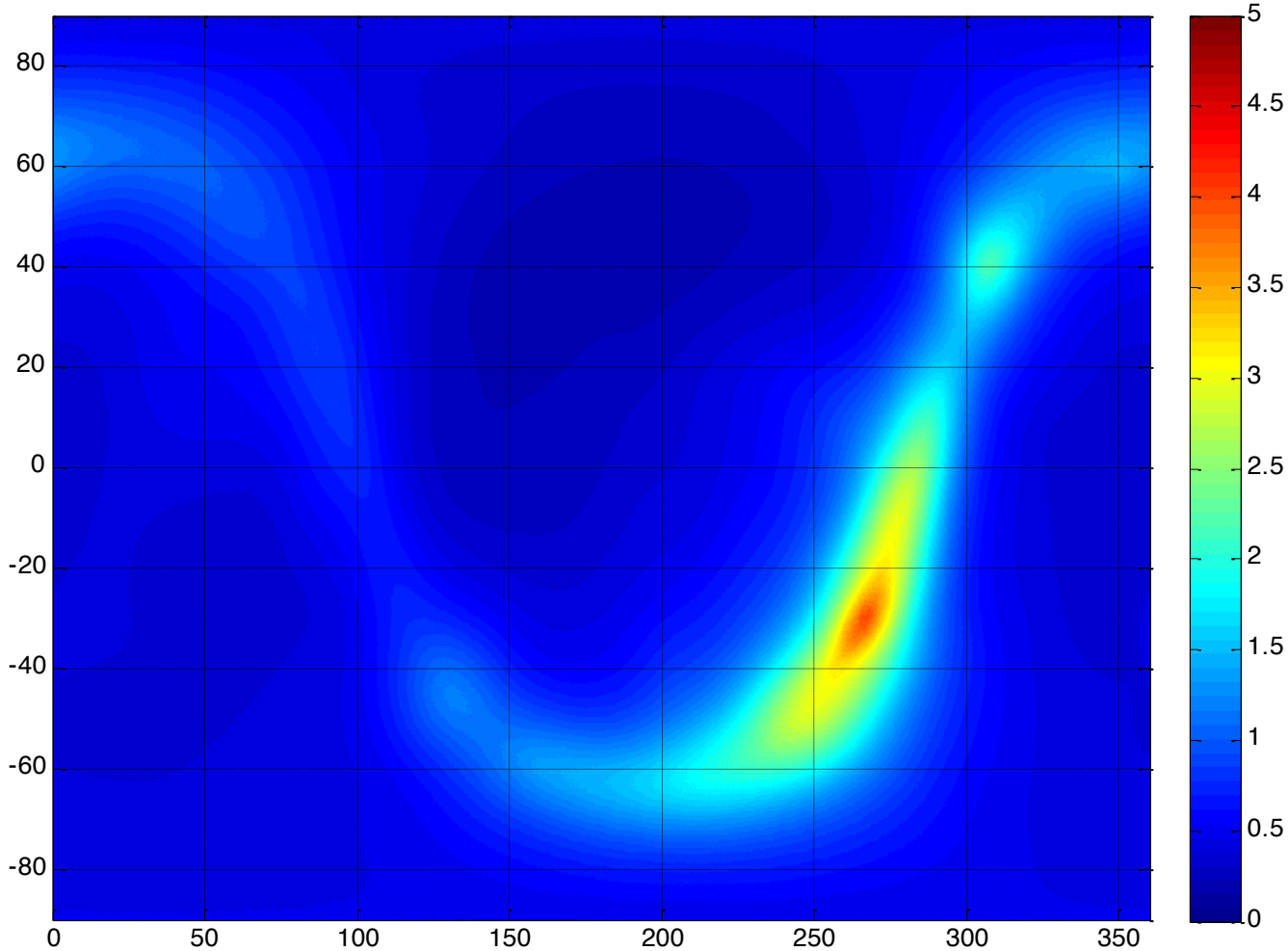
Current Galaxy Model, 2 m/s added to wind speed, 10% increase to peak



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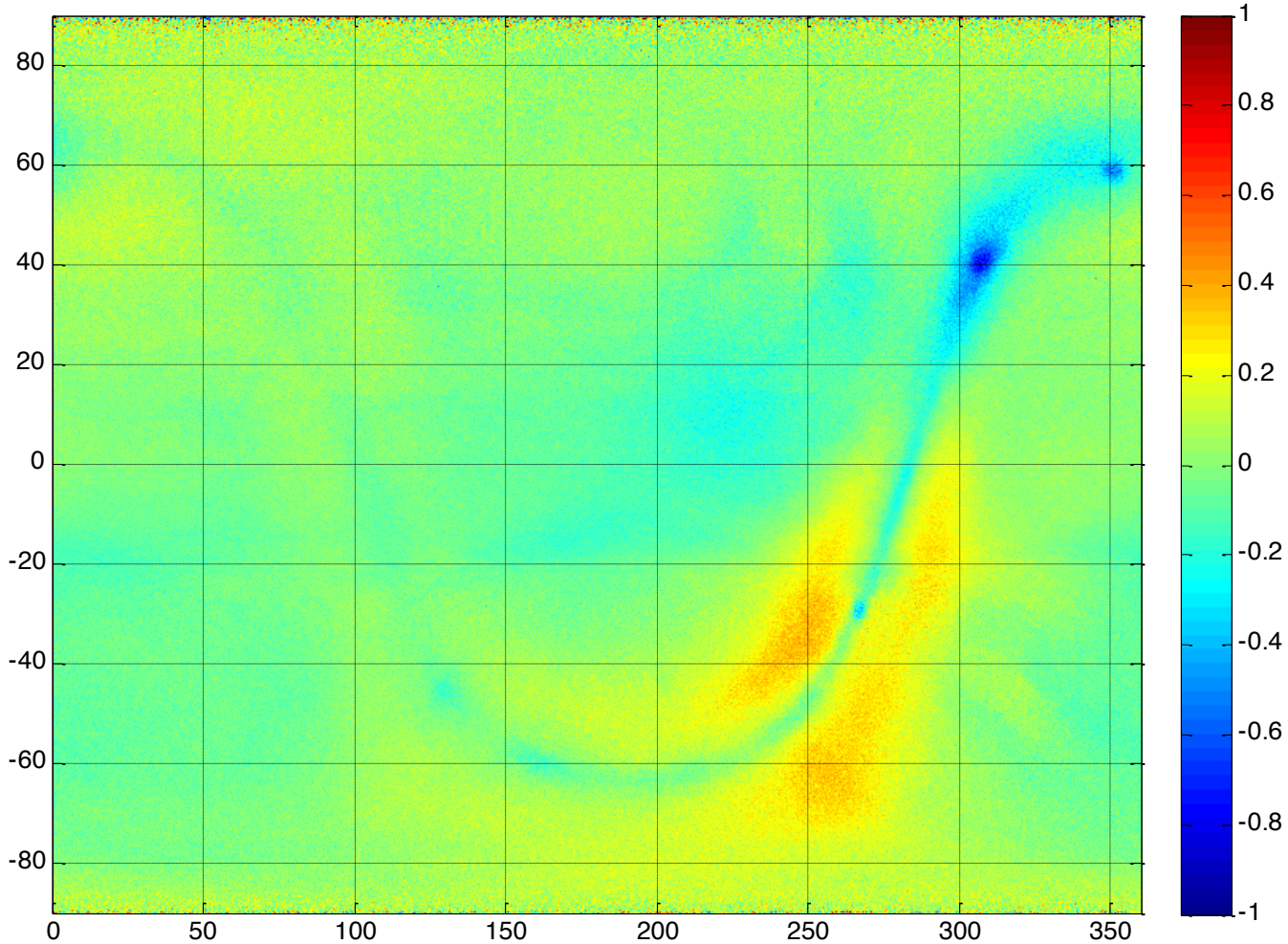
SMAP-derived Model minus Current Galaxy Model



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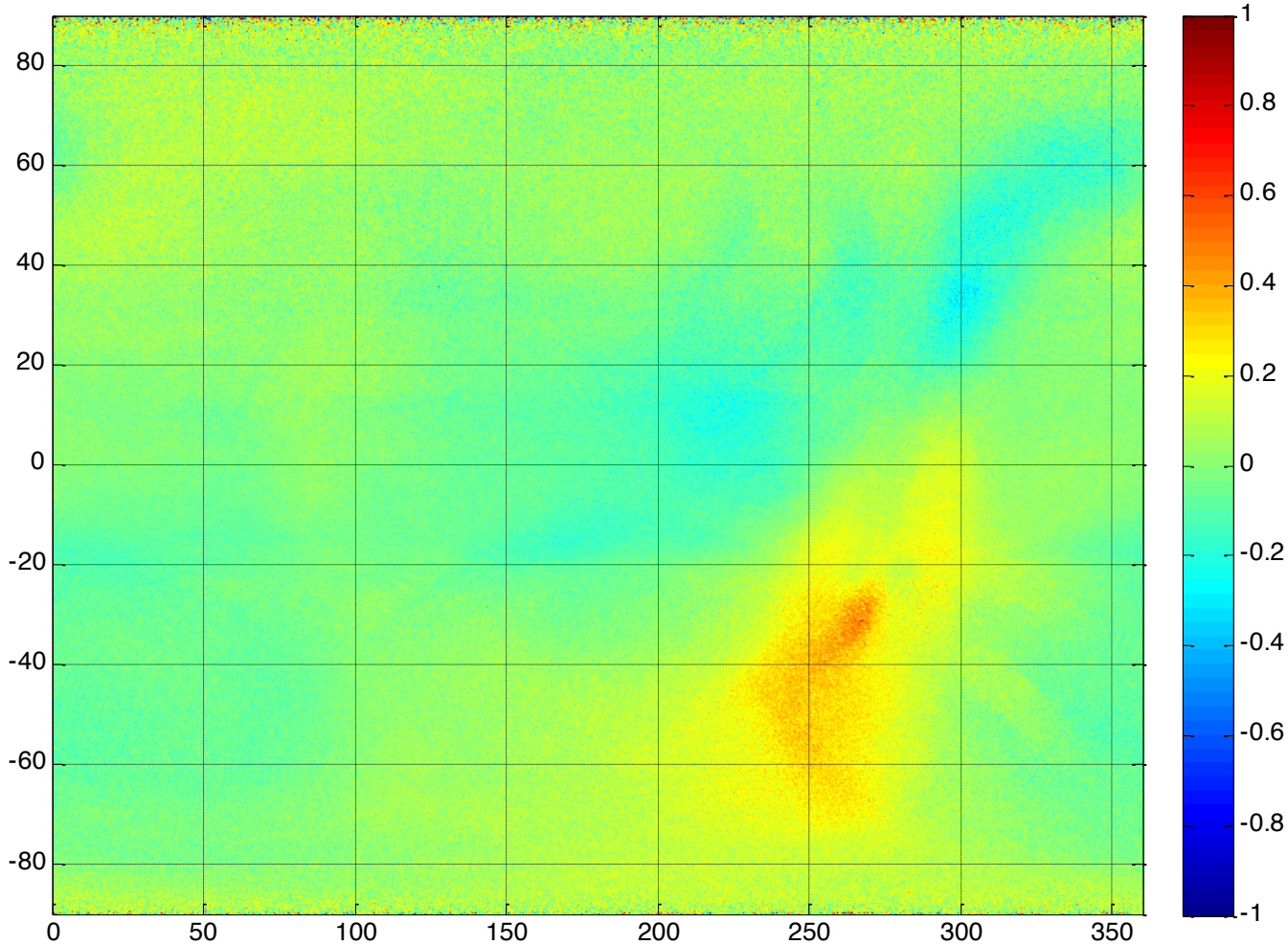
SMAP-derived Model minus Current Galaxy Model with 2m/s added



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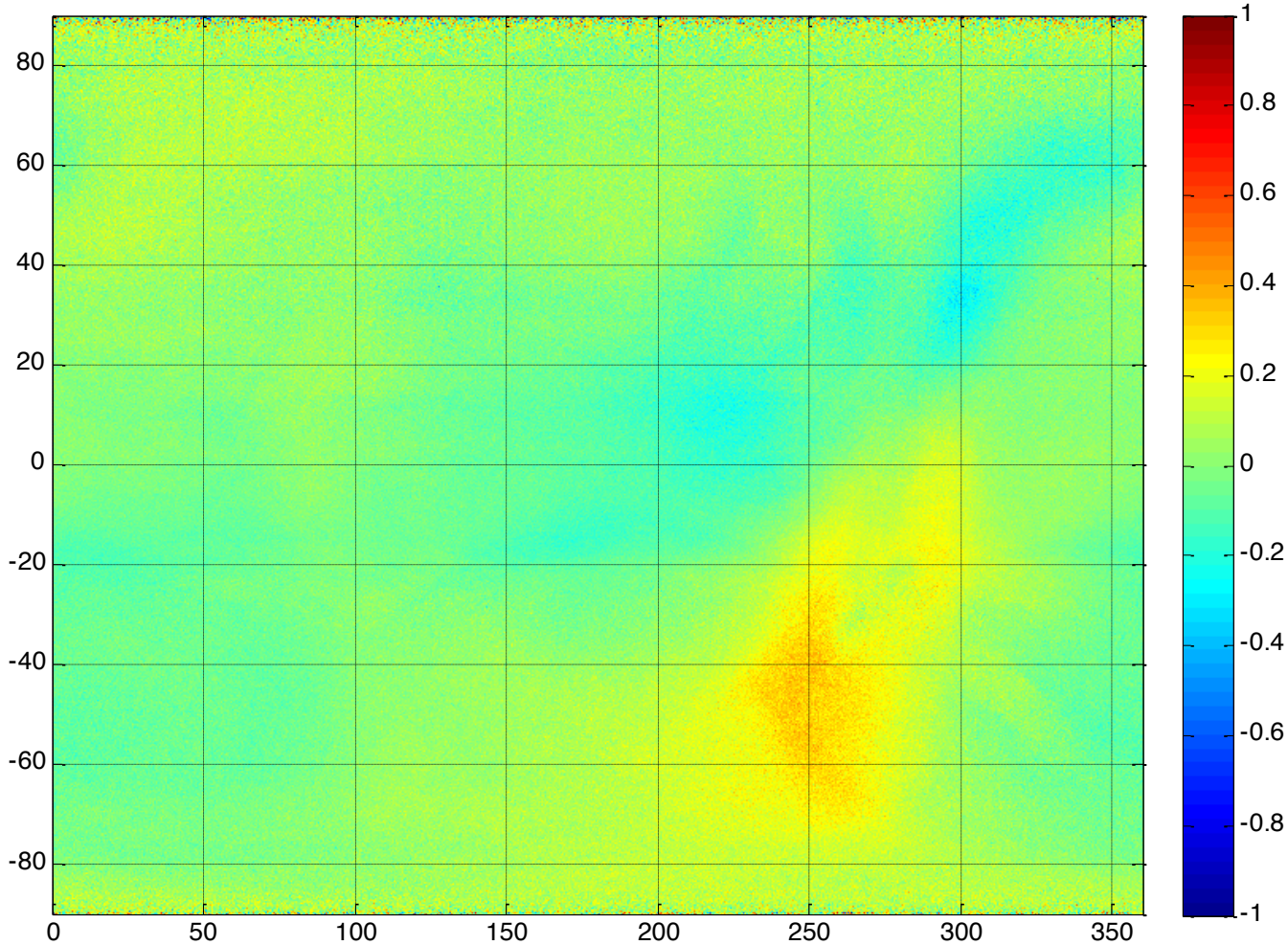
SMAP-derived Model minus Galaxy Model with 2 m/s added and peak is scaled



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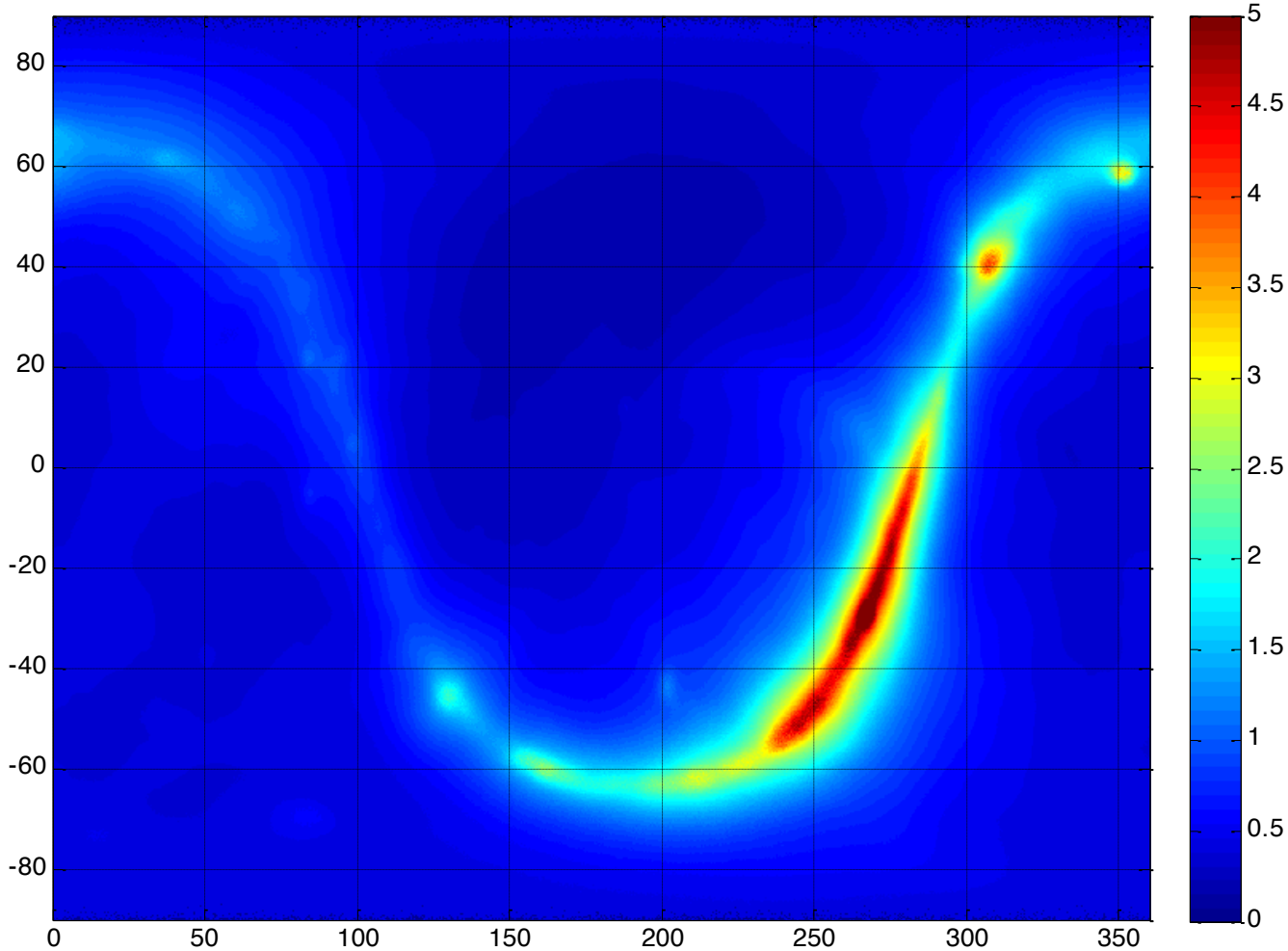
Current Galaxy Model, Wind < 5 m/s



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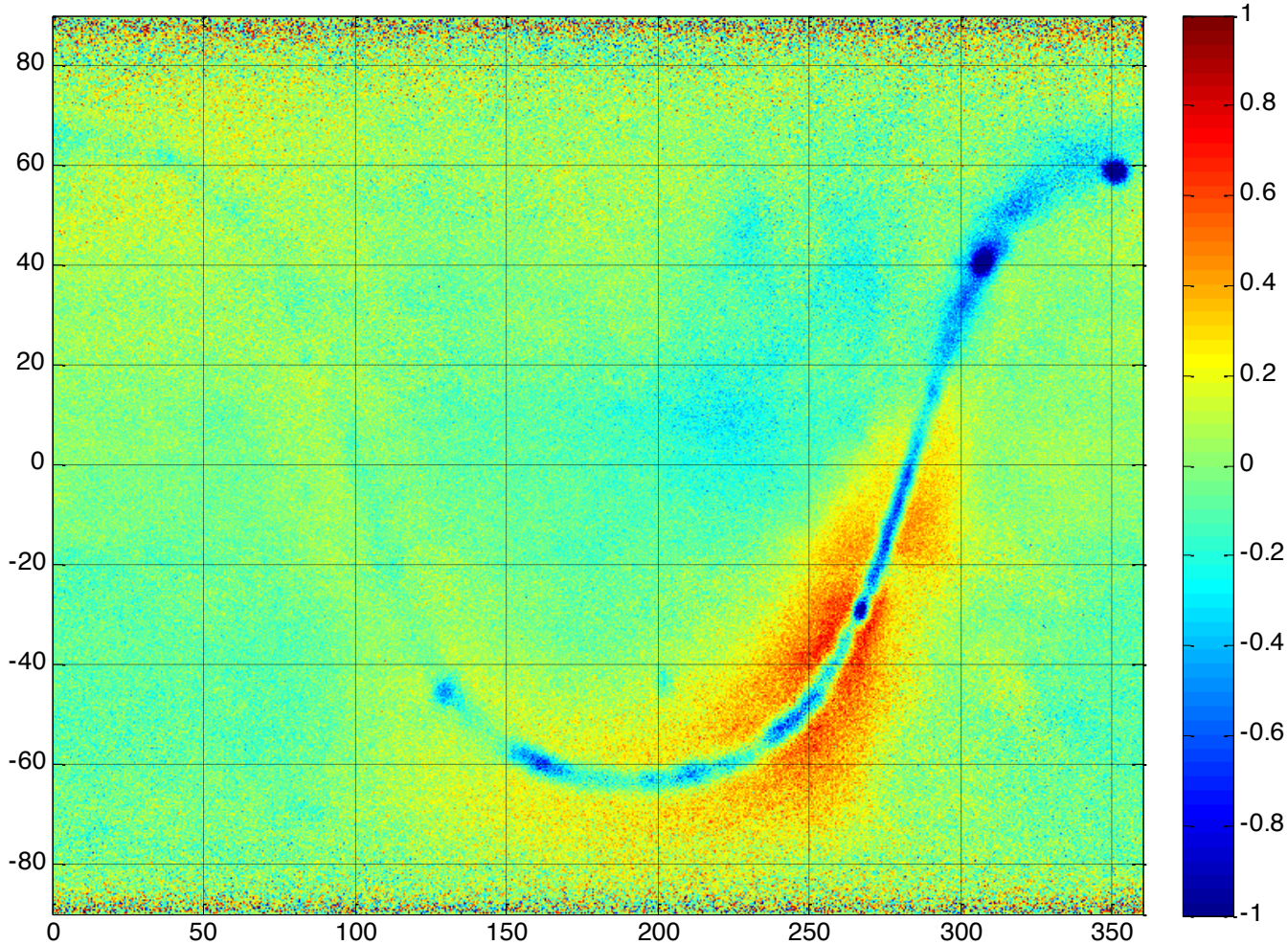
SMAP-derived Model minus Current Galaxy Model, Wind < 5 m/s



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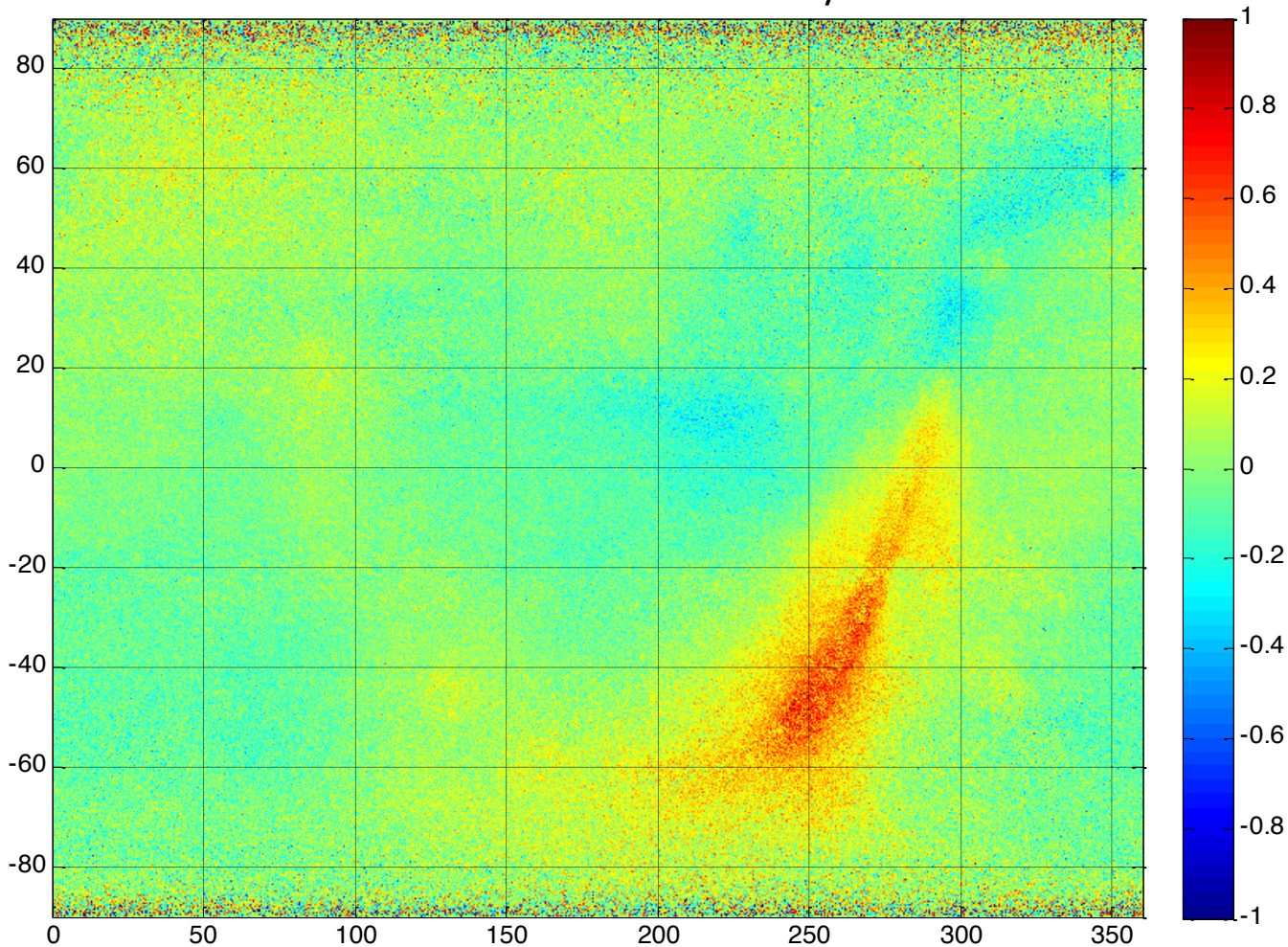
SMAP-derived Model minus Galaxy Model with 2 m/s added and peak is scaled
Wind < 5 m/s



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