



Complete Refresh of Aquarius Algorithm Tables

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Complete Refresh of Algorithm Tables

Empirical Analyses: GRASP 2012 Antenna Patterns put too little power in mainlobe

- Based on TB consistency for Cold Space, Ocean, and Land
- Hybrid Antenna Patterns Generated by Emmanuel and Thomas

Small positional error in the LeVine-Dinnat TB Galaxy Map

Land

- Side-lobe correction Tables
- Land Fraction Tables: Gain-weighted (Gland) and Area-Weighted (Fland)

Sun

- Direct Contribution Tables
- Reflected Contribution Tables

Galaxy

- Direct Contribution Tables
- Reflected Contribution Tables (5 winds)



Consistency with SMAP Algorithm Tables

**Refresh of Aquarius Algorithm Tables done in Parallel with
Generation of Pre-Launch SMAP Algorithm Tables**

As much consistency as possible built into the two sets of Tables

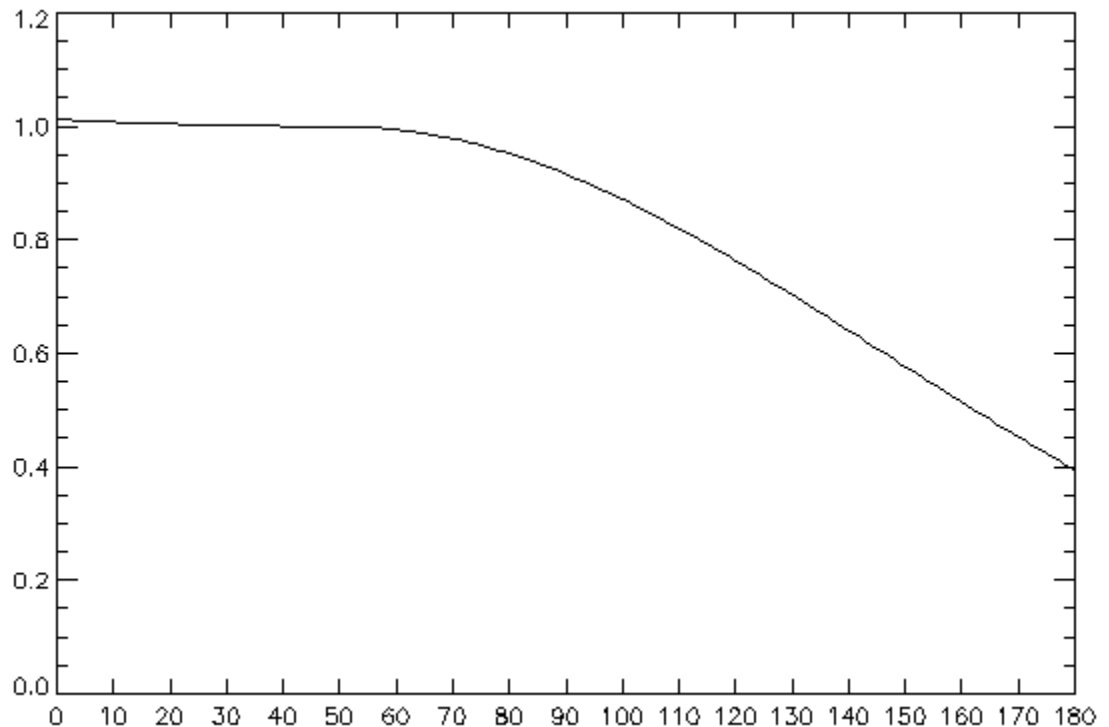


Construction of Hybrid Antenna Patterns

Scale gain power to match spillover from scale patterns = spillover used in V3.0.

Leave APC matrix elements as in V3.0.

$$s(\theta) = \begin{cases} \exp[\alpha \cdot (\theta - \theta_c)^2], & \theta \leq \theta_c \\ \exp[-\beta \cdot (\theta - \theta_c)^2], & \theta > \theta_c \end{cases} \quad \theta_c = 50^\circ$$





Spillover Values

Channel	Spillover GRASP 2012 from orbit simulator	Spillover chosen for V3.0	Spillover hybrid patterns from orbit simulator
1V	0.04018	0.02923	0.02948
1H	0.04545	0.02902	0.02896
2V	0.04669	0.03516	0.03611
2H	0.04788	0.03016	0.03096
3V	0.05447	0.04134	0.04463
3H	0.05508	0.03934	0.04164



APC

A-matrix
GRASP 2012
orbit simulator

A-matrix V3.0

A-matrix
Hybrid patterns
orbit simulator

horn 1

1	1.04484	-0.03827	-0.00387
2	-0.00297	1.07860	0.03089
3	-0.00009	-0.02582	1.07551

horn 1

1	1.0300	-0.0350	+0.0500
2	0.0001	1.0641	+0.0300
3	0.0000	-0.0258	1.0755

horn 1

1	1.03009	-0.03410	-0.00061
2	0.00028	1.06166	0.02357
3	-0.00011	-0.02590	1.07779

horn 2

1	1.04967	-0.03432	-0.00737
2	-0.00063	1.05936	-0.01558
3	-0.00272	0.01112	1.05553

horn 2

1	1.0337	-0.0304	0.0000
2	0.0027	1.0435	-0.0144
3	-0.0006	+0.0211	1.0555

horn 2

1	1.03465	-0.02829	-0.00739
2	0.00284	1.04475	-0.01606
3	-0.00373	0.01031	1.06918

horn 3

1	1.05800	-0.03435	-0.01157
2	-0.00036	1.04848	0.00708
3	-0.00324	-0.01480	1.04885

horn 3

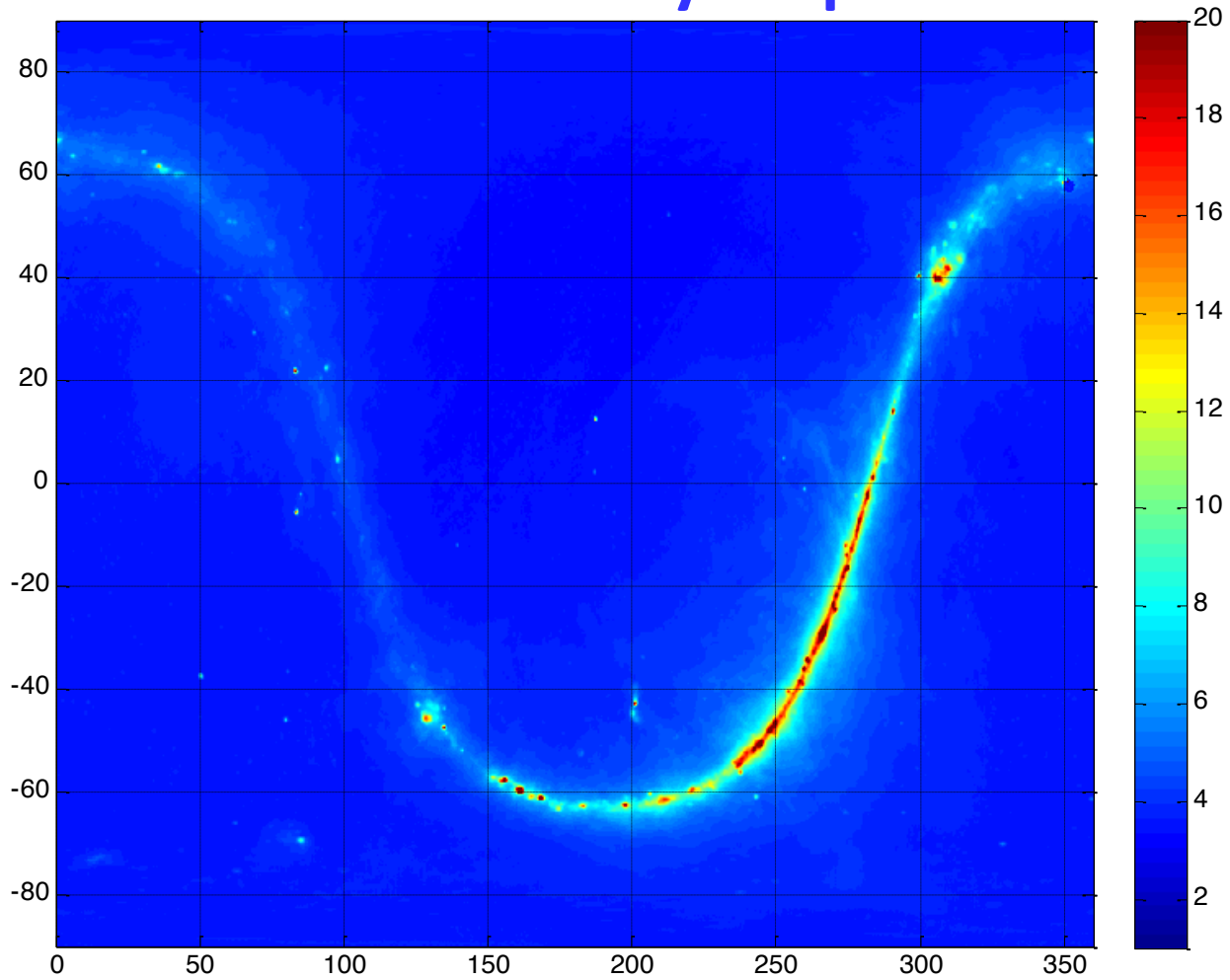
1	1.0420	-0.0326	+0.0250
2	0.0011	1.0328	+0.0215
3	0.0000	-0.0148	1.0489

horn 3

1	1.04505	-0.03028	-0.00655
2	0.00162	1.03835	0.00306
3	-0.00321	-0.01413	1.05891

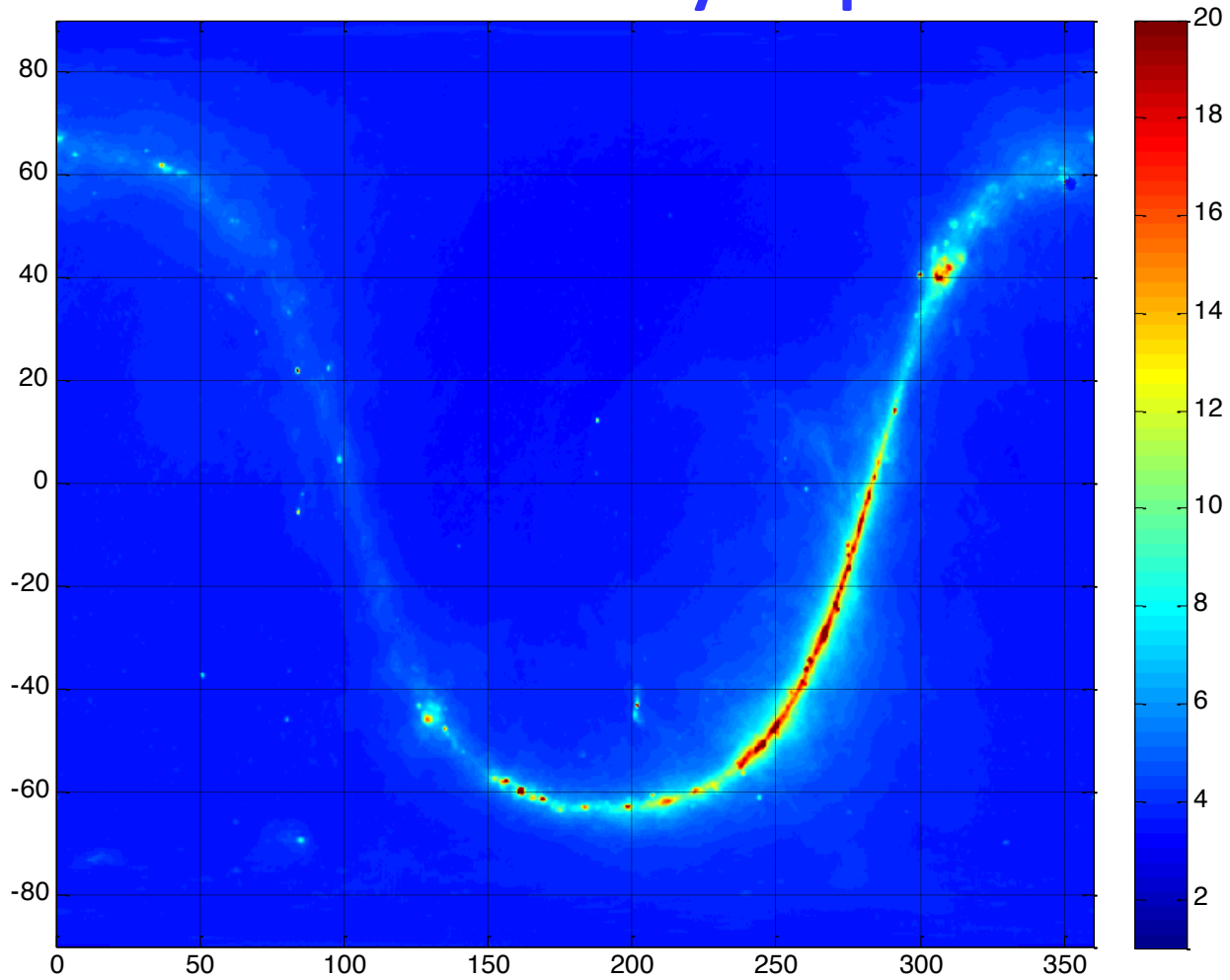


Old Galaxy Map



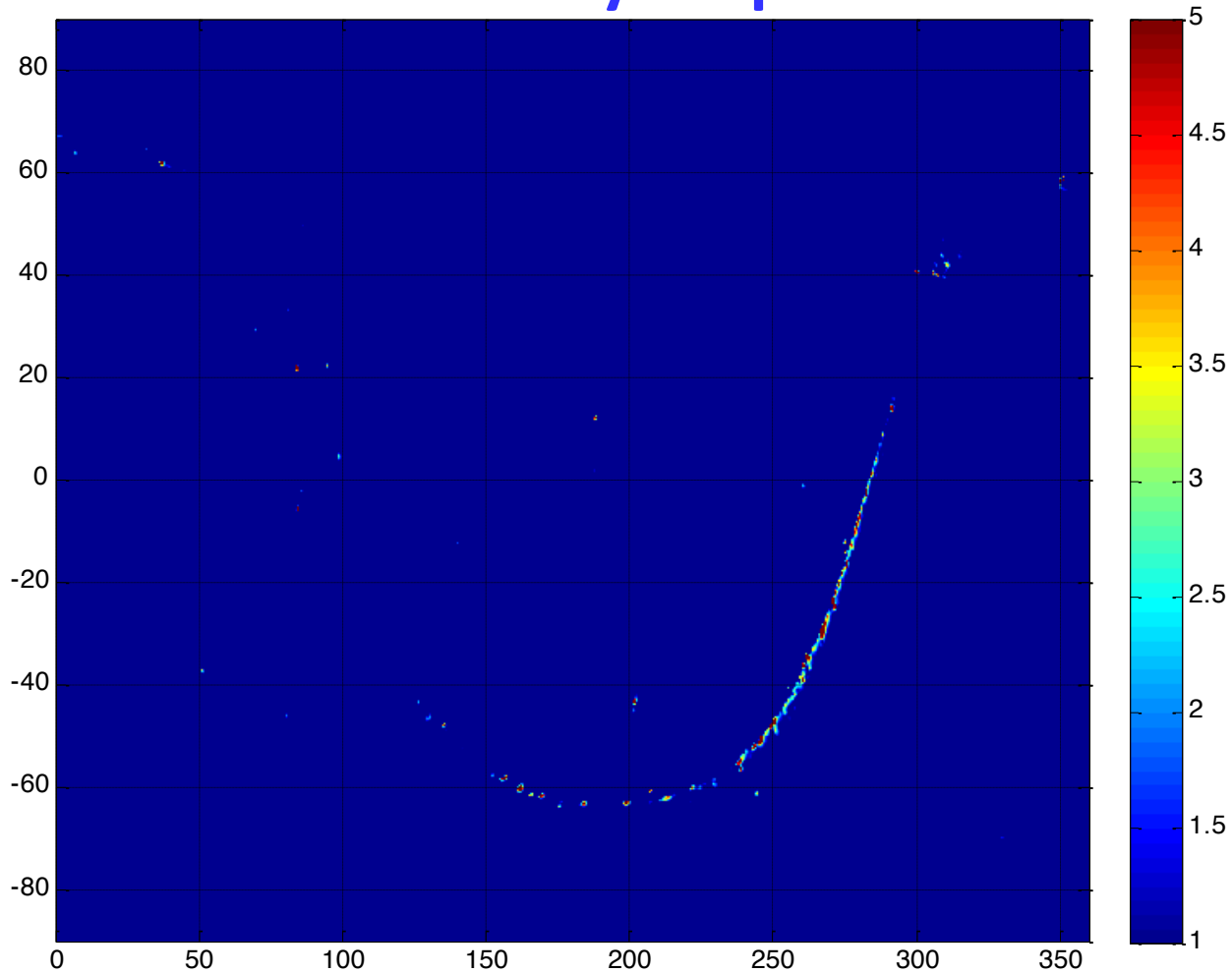


New Galaxy Map



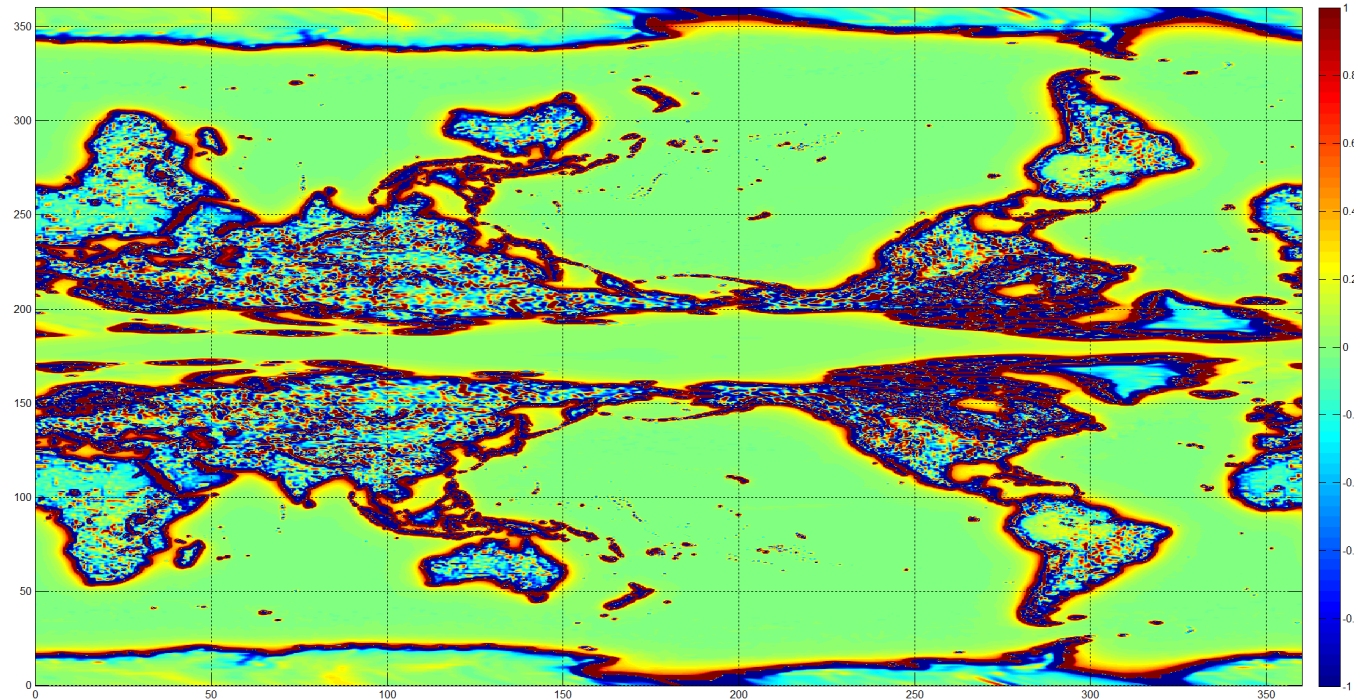


New - Old Galaxy Map Difference





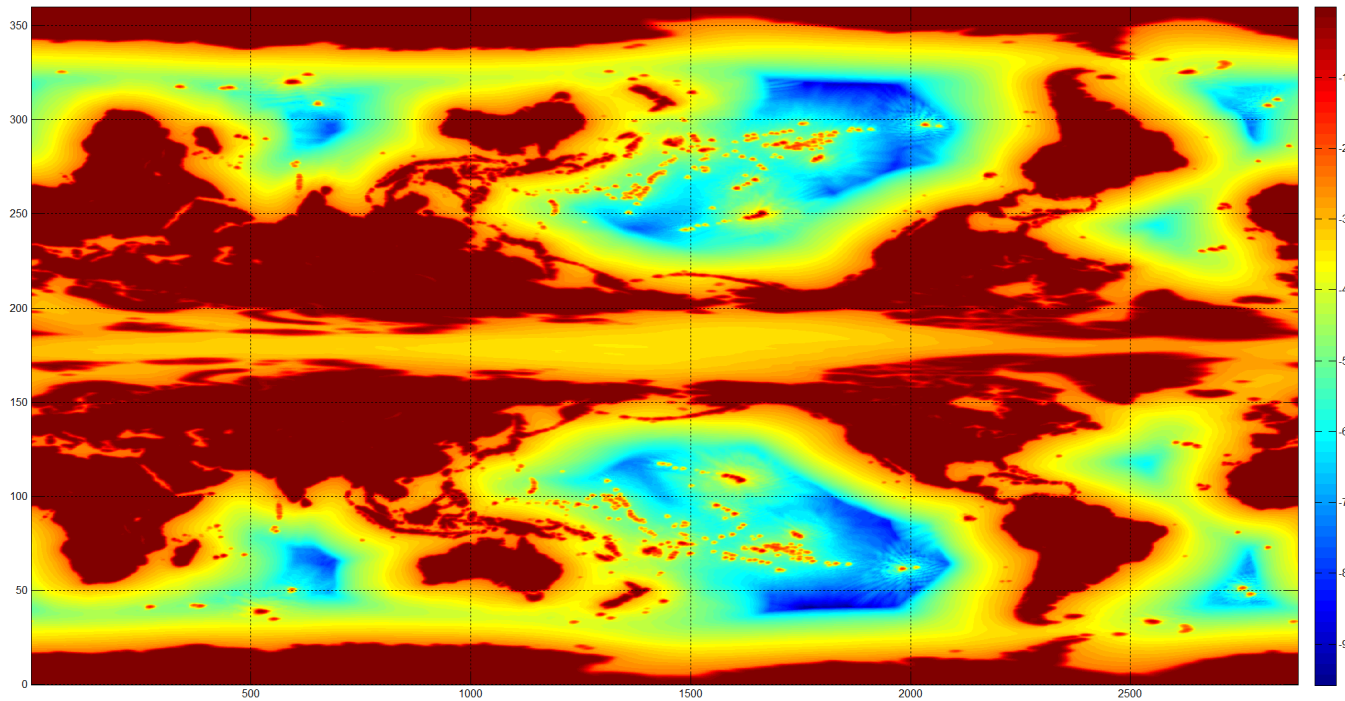
Land Correction (Inner Horn, V-pol)





Gain-Weighted Land Contamination (Gland) (Inner Horn)

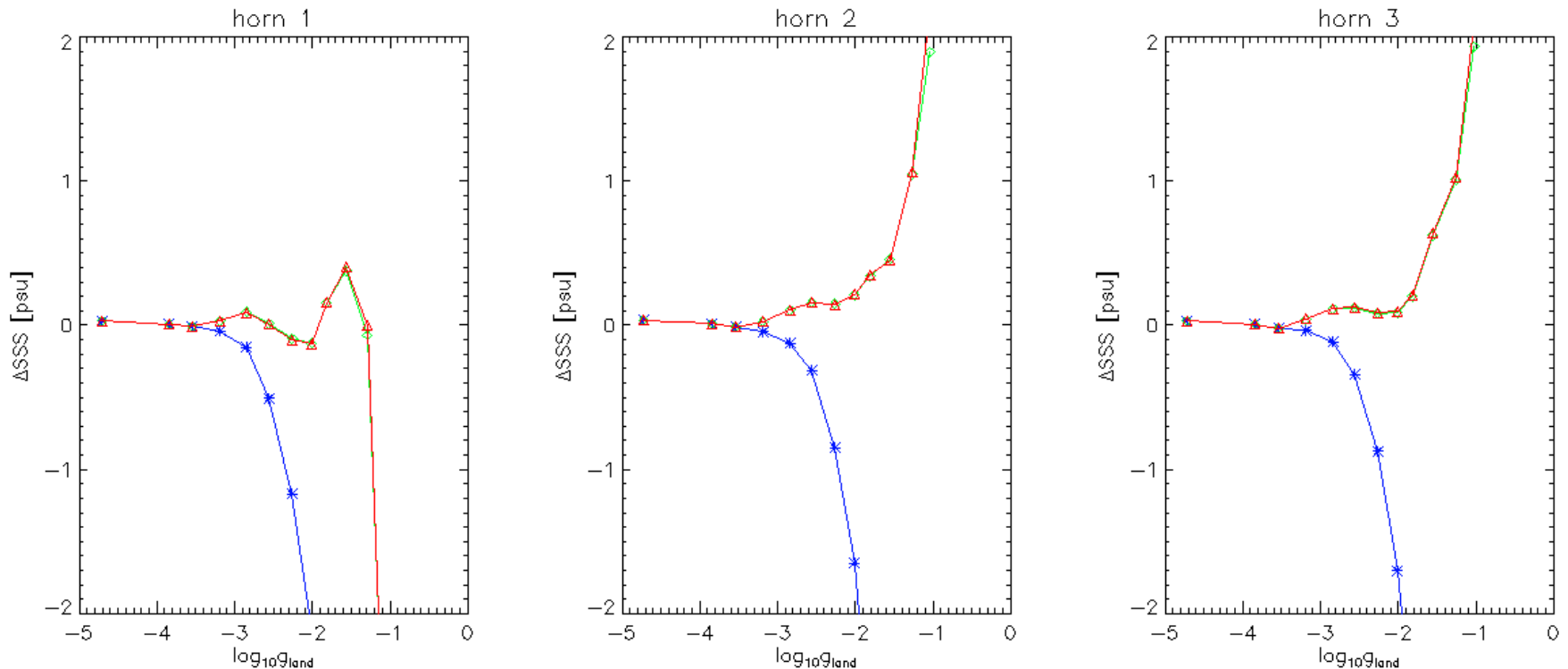
$A_{\log 10}(\text{Gland})$



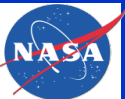


Land Correction

BIAS SSS Aquarius – HYCOM as function of log(gland)

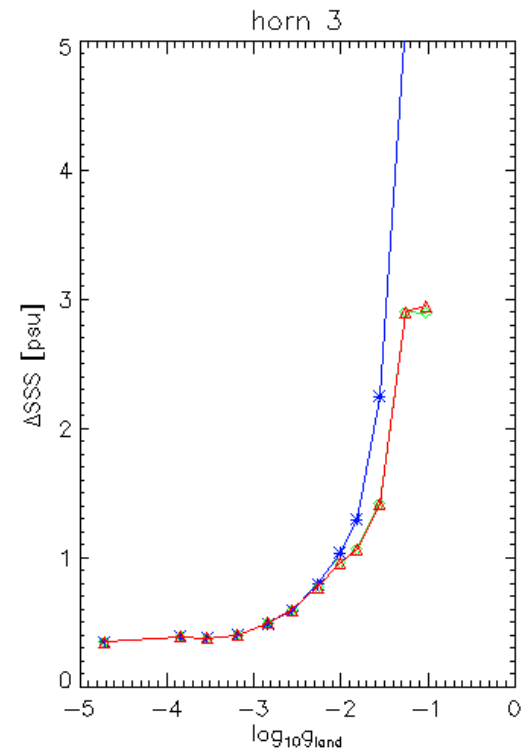
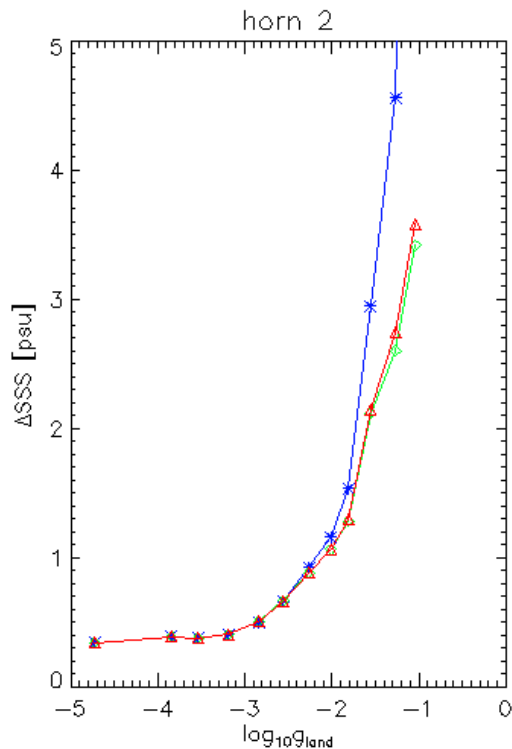
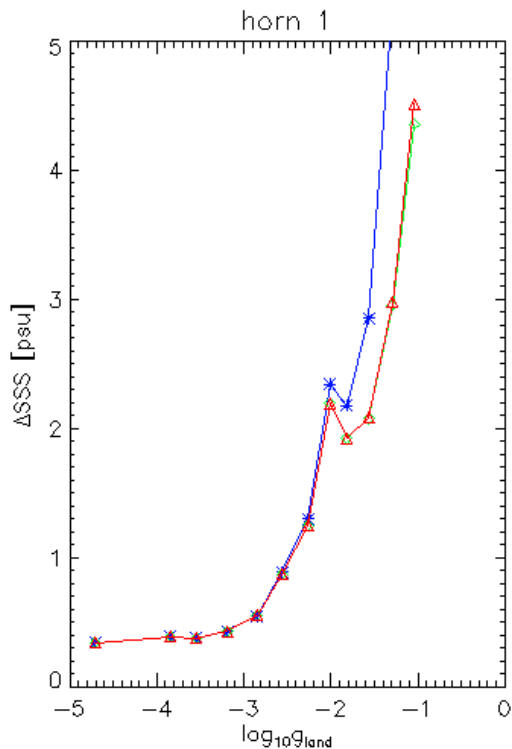


no land correction
land correction V3.0
land correction hybrid AP



Land Correction

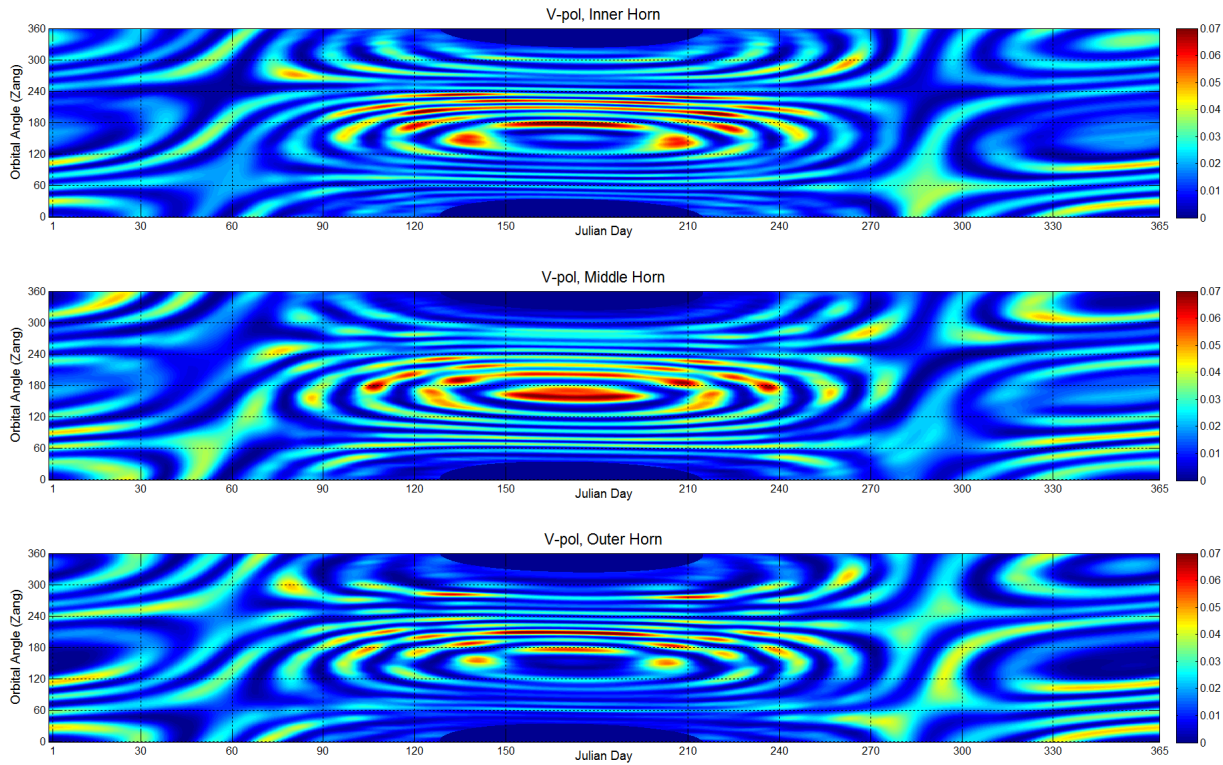
StdDev SSS Aquarius – HYCOM as function of log(gland)



no land correction
land correction V3.0
land correction hybrid AP

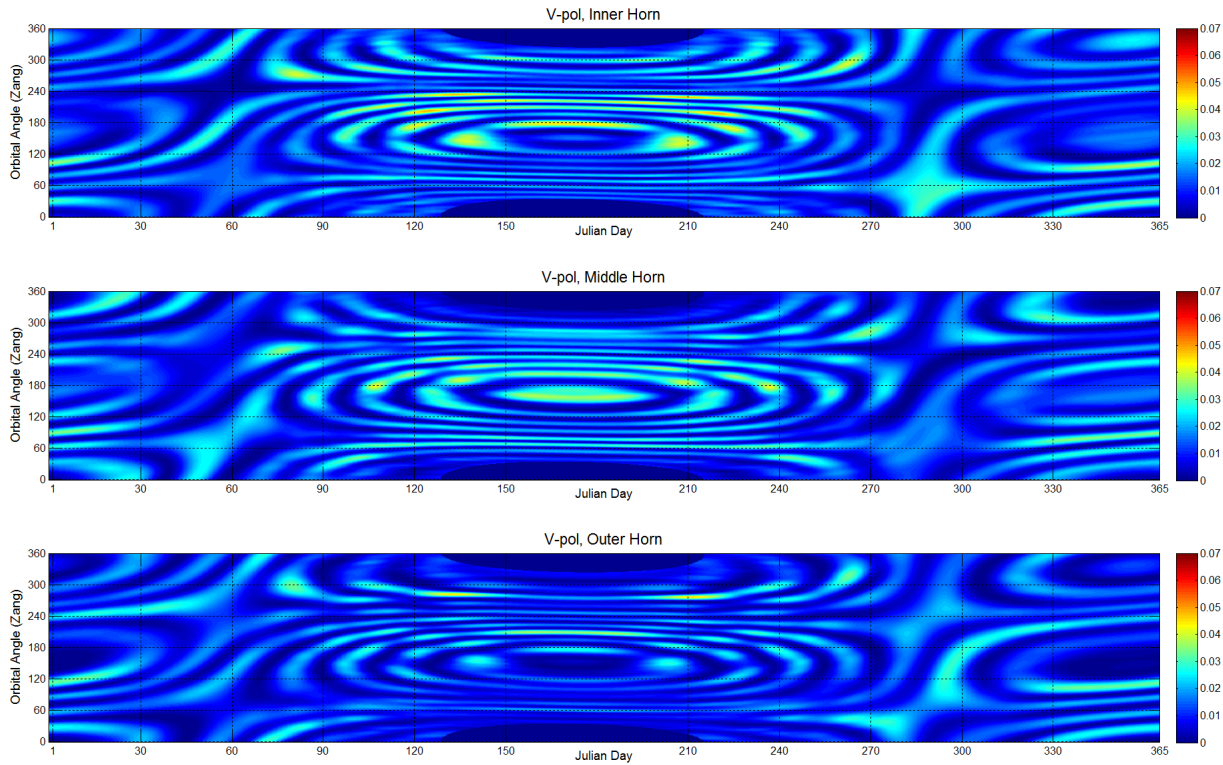


Old Sun Direct Tables



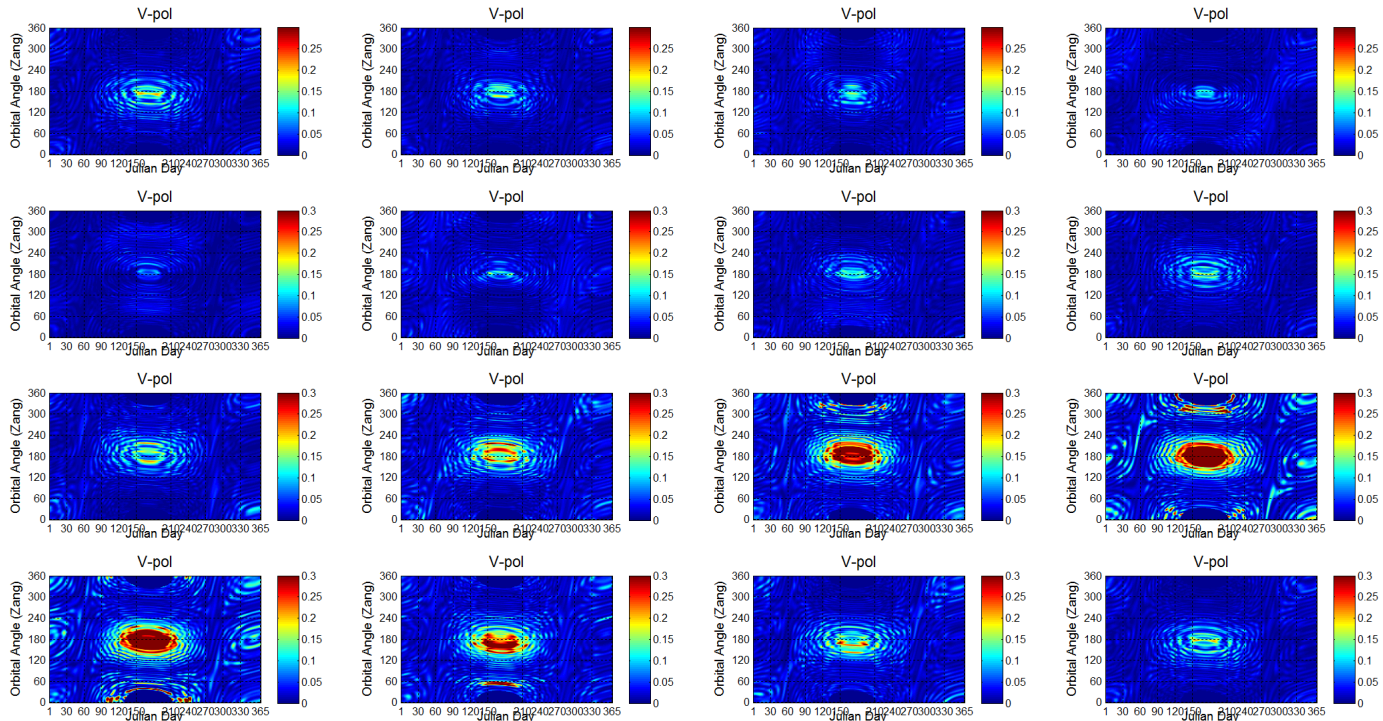


New Sun Direct Tables





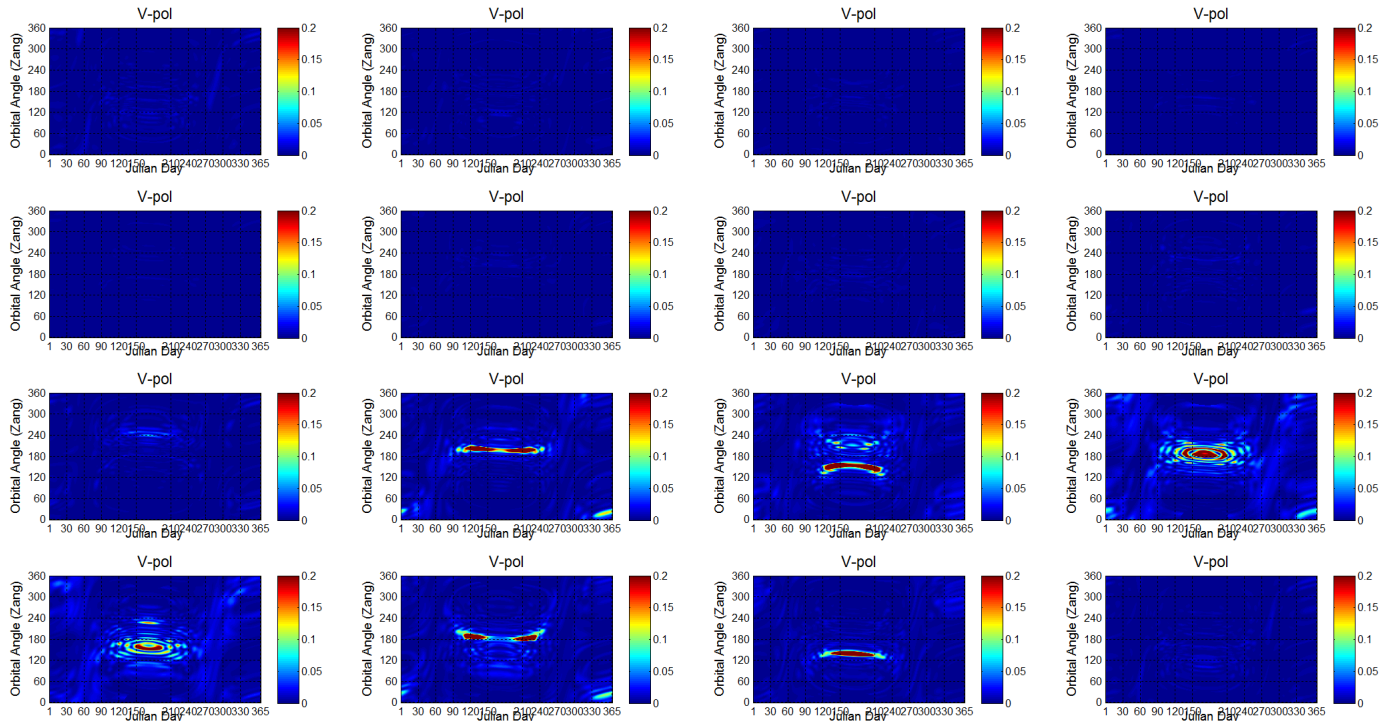
SMAP Sun Direct Tables: V-Pol



Much Larger than Aquarius for Some Look Directions



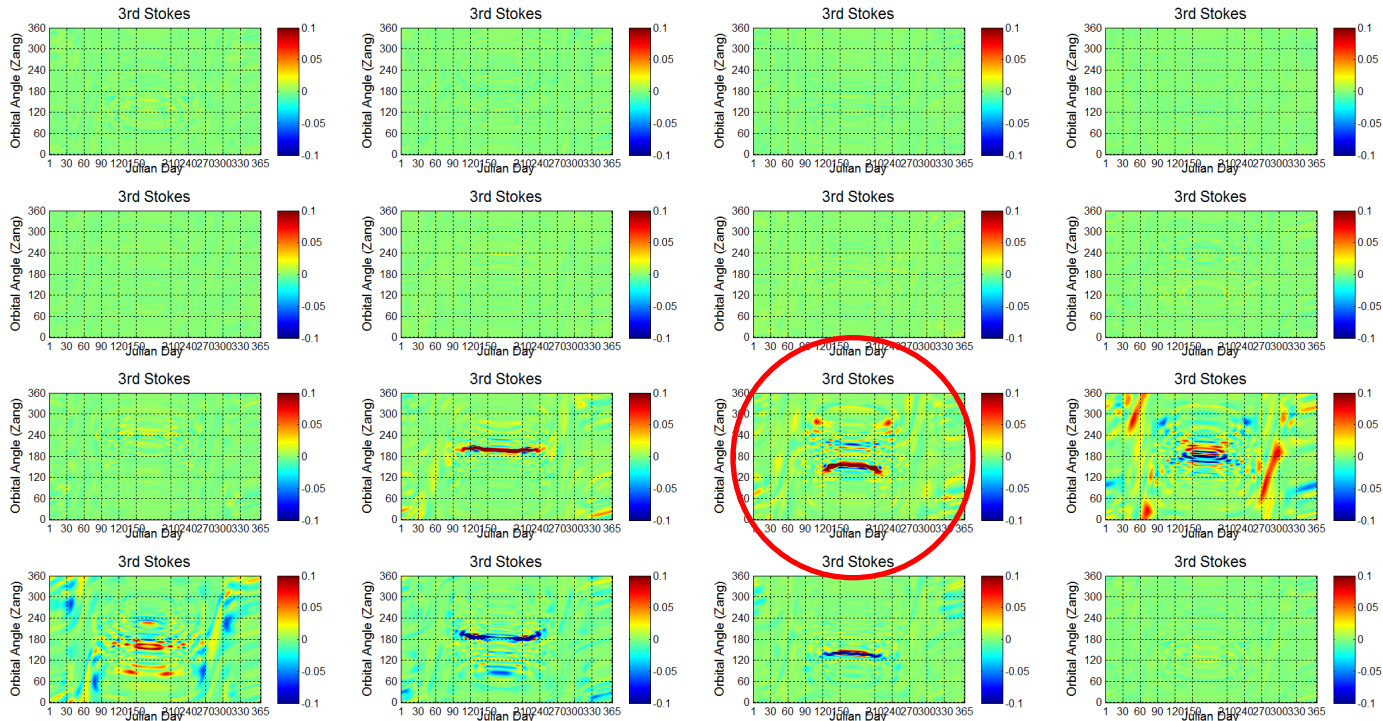
SMAP Sun Reflected Tables: V-Pol



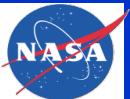
Much Larger than Aquarius for Some Look Directions



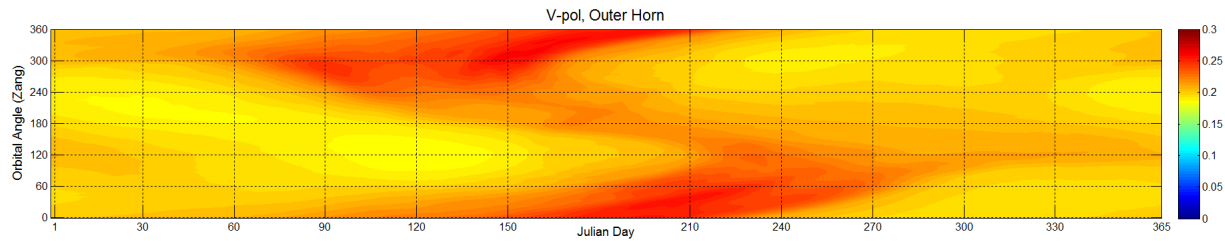
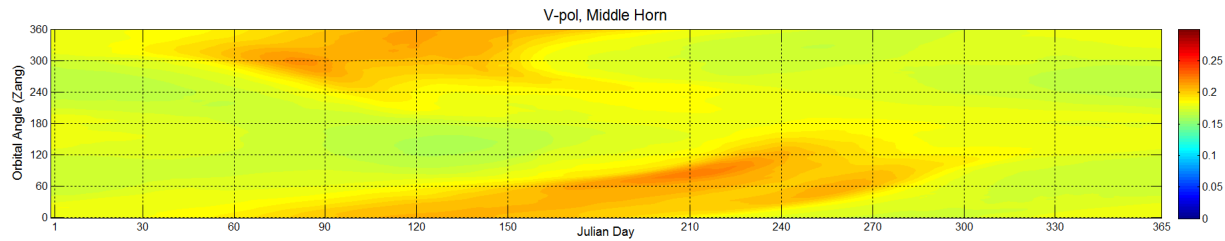
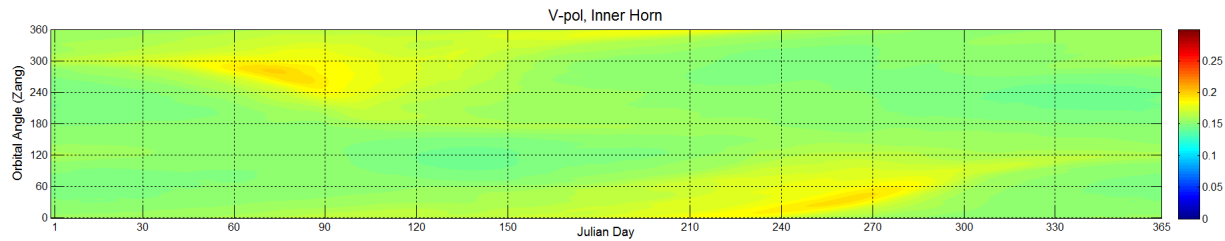
SMAP Sun Reflected Tables: Third Stokes



Gremlins Hiding in SMAP Solar Radiation ?

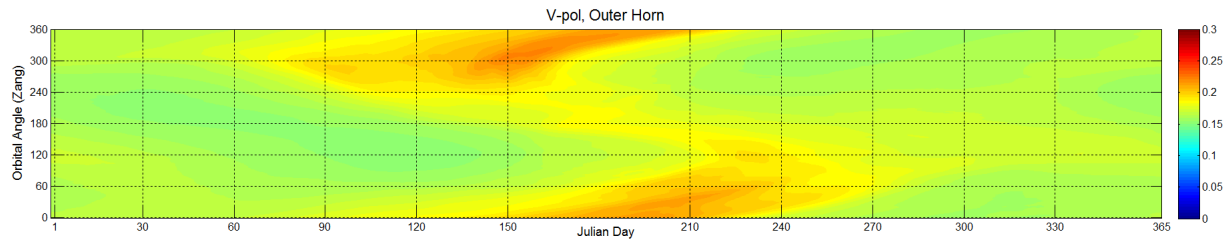
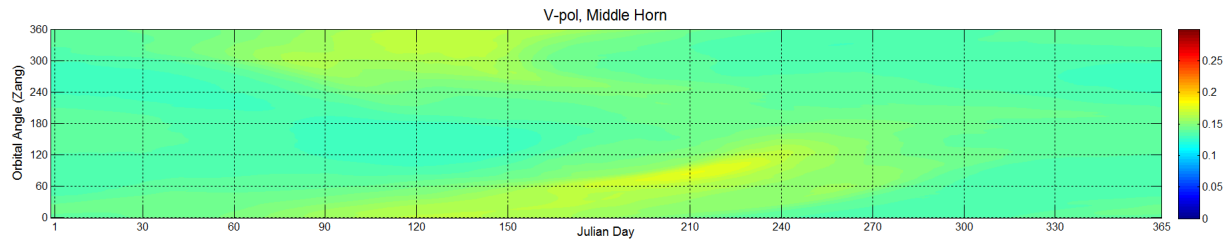
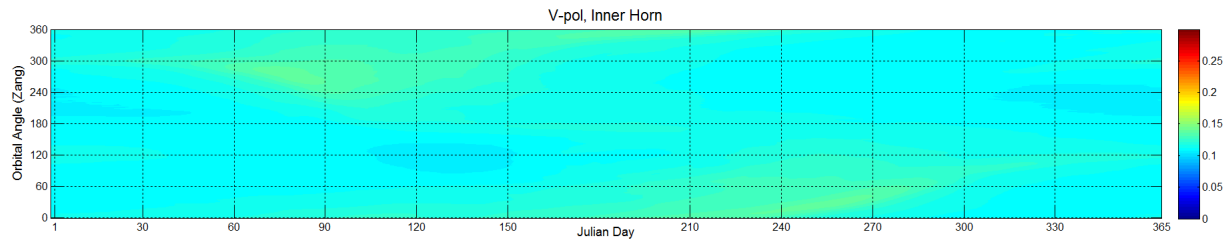


Old Galaxy Direct Tables



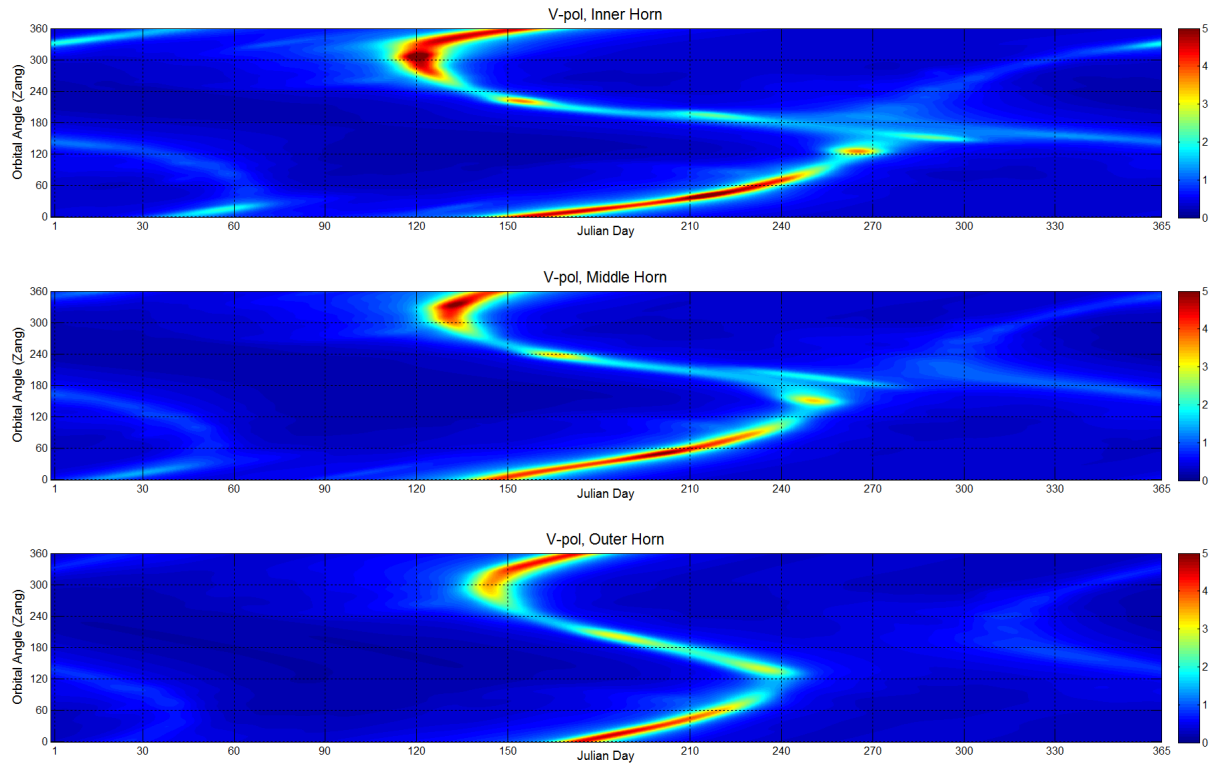


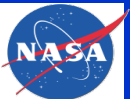
New Galaxy Direct Tables



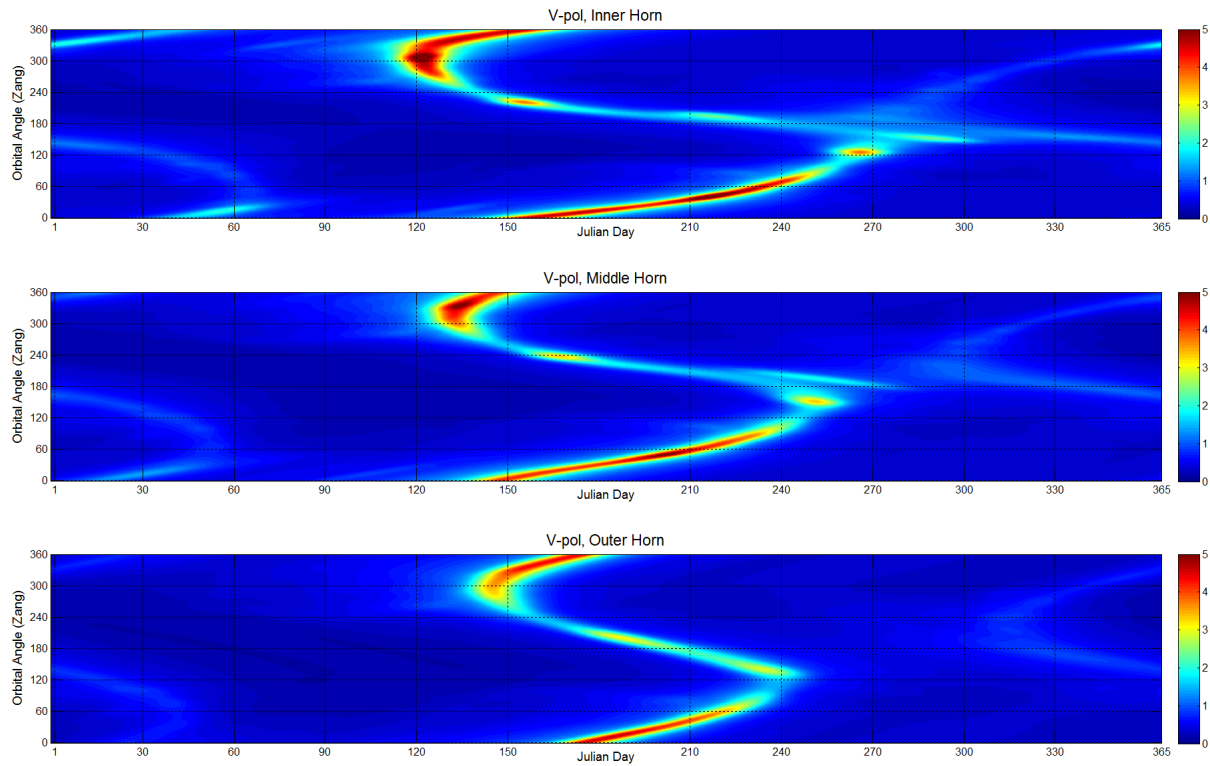


Old Galaxy Reflected, Zero Wind



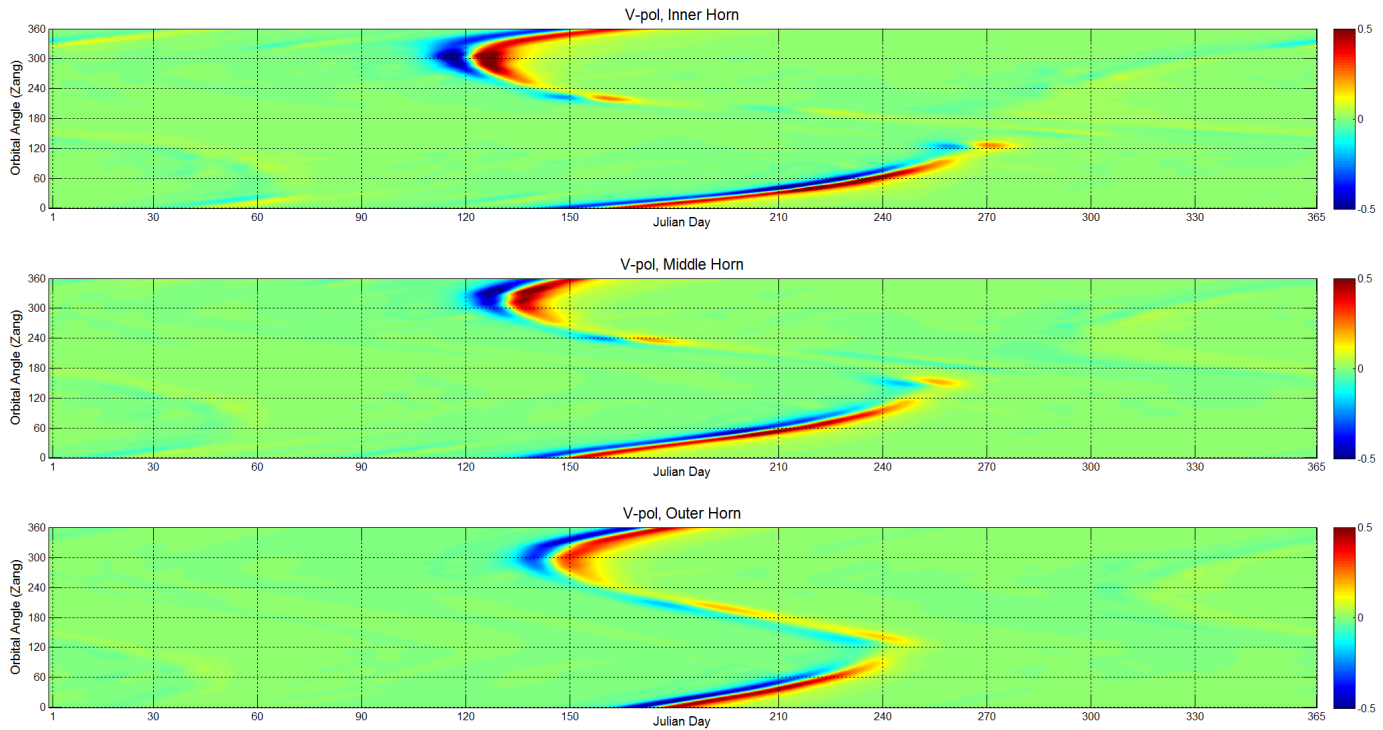


New Galaxy Reflected, Zero Wind



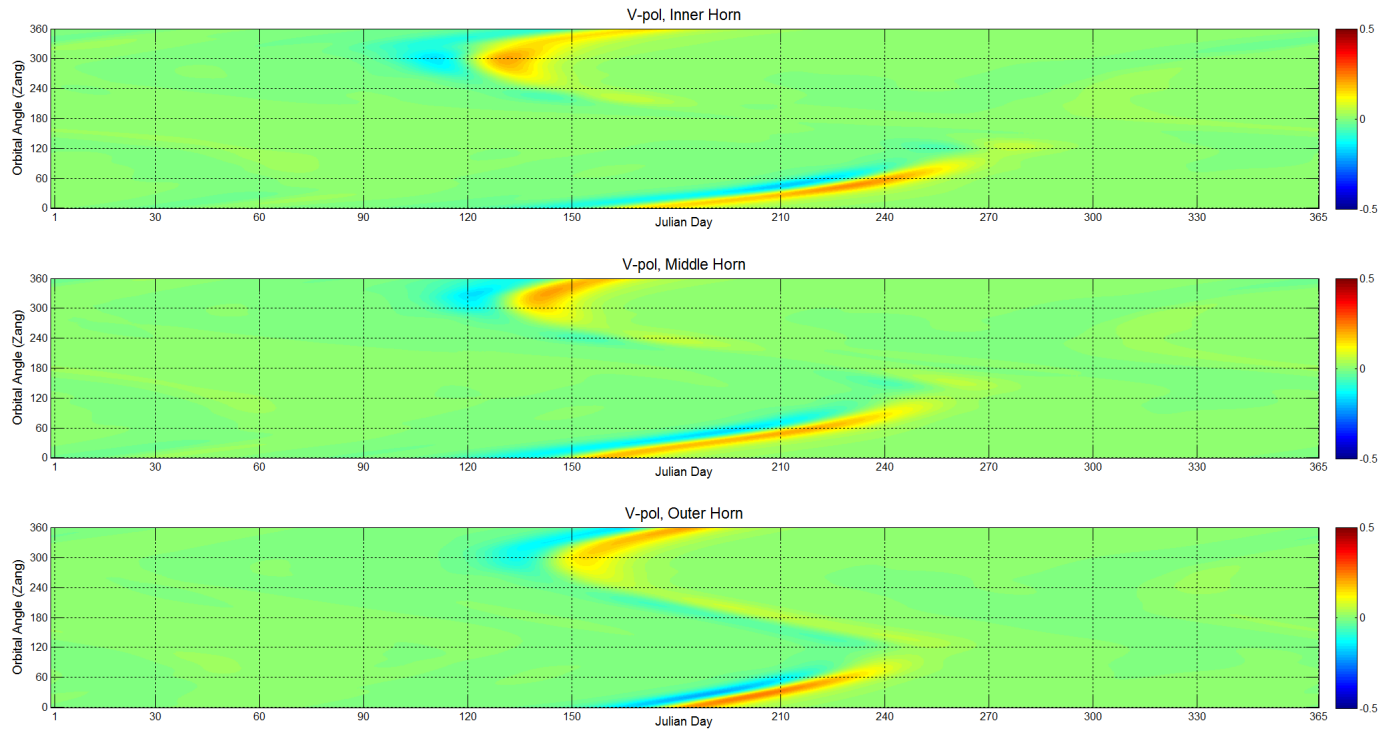


New Minus Old Galaxy Reflected, Zero Wind



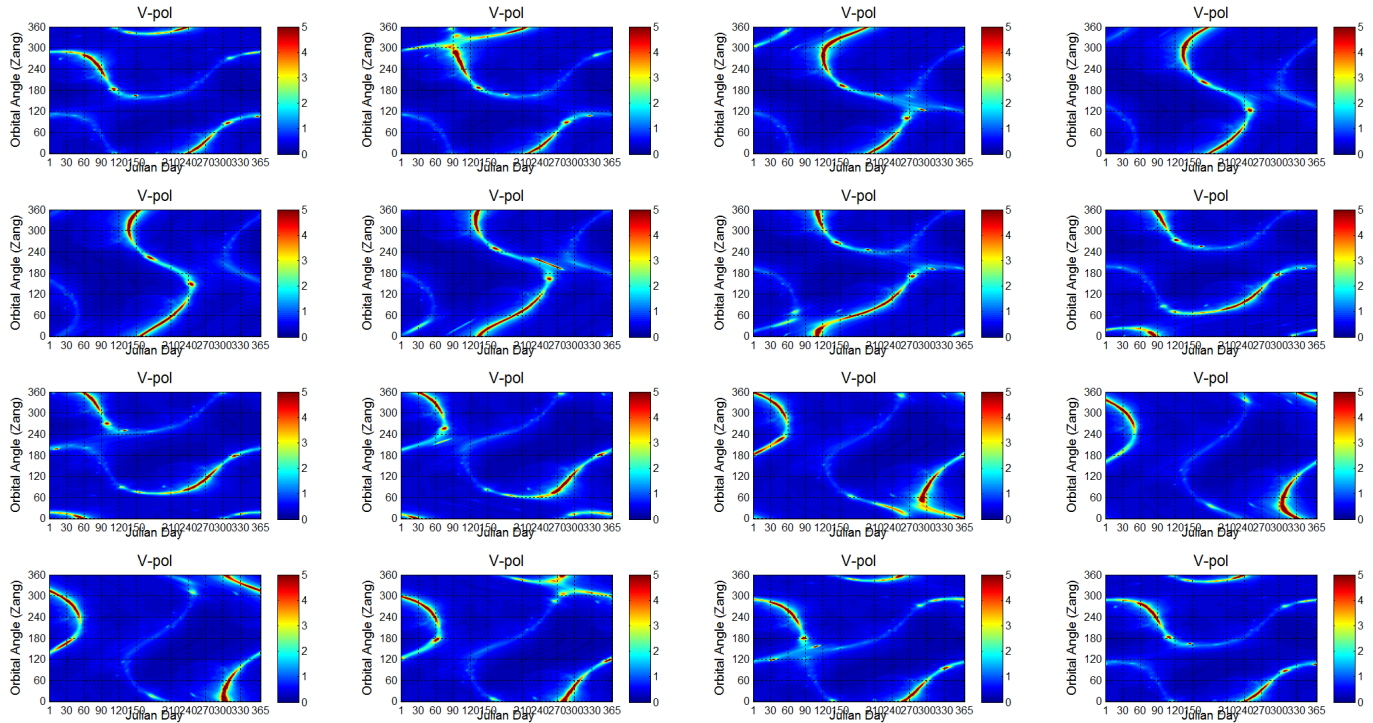


New Minus Old Galaxy Reflected, 5 m/s Wind





SMAP New Galaxy Reflection Tables, Zero Wind





Summary and Conclusions

Aquarius Algorithm Tables Regenerated using New Antenna Pattern and Galaxy Map

Land

- Impact is Relatively Small on Land Correction
- Error in Land Correction may be driven by Land TB model rather than antenna pattern.

Sun

- Sun contamination is even smaller than before.

Galaxy

- Need to assess the impact on the Galaxy Correction
- SMAP will soon provide much information on the Galaxy

SMAP

- A complete set of analogous Algorithm Tables have been generated for SMAP.
- For some look directions, solar radiation will be a problem (no surprise).
- The wide variety of Galaxy views will be particularly useful.