Radio Frequency Interference on the SGP and Worldwide

Tom Clark, Scott Galbraith, Jeremy Hill, and Larry Hilliard

July 18th, 2012

July 18th, SGP Intern Lunch time speaker Agenda

- Scott Galbraith – Spectrum Management at GSFC
- ↳Larry - RFI experienced in Space borne Radiometers
- Larry – RFI on Space Geodesy Project introduction
  - Jeremy– Solving the RFI Problems at GGAO
- Tom – RFI on VLBI 2010 and legacy systems

Radio Frequency Interference confirmed from Low Earth Orbit

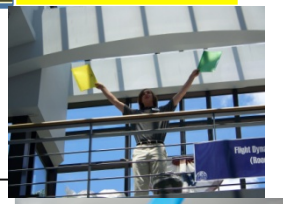
1.413 GHz

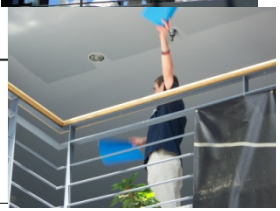
S-Band

Frequency Band	Confirmed or Potential	Instruments	Nature of RFI
L-band	Potential	SMOS/MIRAS Aquarius/SAC-D SMAP	Likely to be OOB emissions from terrestrial radars
C-band	Confirmed Expected	SMMR on SeaSat and Nimbus 7 AMSR-E on EOS Aqua WindSat on Coriolis MIS on NPOESS	Majority is likely fixed service (FS) communcations. Mobile service (MS) and radiolocation possible. Proliferation of Part 15 USB devices expected.
X-band	Confirmed Potential	AMSR-E WindSat GMI on GPM core satellite MIS	Allocation shared with FS. WindSat uses extended band up into Direct Broadcast Service (DBS).
K-band 24 GHz	Potential	MIS and GMI ATMS on NPP (and NPOESS)	Allocation shared with Fixed Satellite Service (FSS) S-E links and FS. No confirmed cases. Shared with UWB vehicular radars. No RFI experienced.
Ka-Band	Potential	MIS and GMI	Allocation shared with FS and MS. No confirmed cases.
V-band	Potential	ATMS PATH from NRC Decadal Survey	Part-15 devices growth explosion expected. Allocation shared with inter-satellite service links visible from GEO.

SSS/SST, Soil M

Group Delay Quasars (VLBI 2010)





RFI Problems and Solutions in Spaceborne Microwave Radiometers

Original Table drawn from:

Jeffrey R. Piepmeier

NASA's Goddard Space Flight Center
Microwave Instrument and Technology Branch, Code 555
Greenbelt, MD 20771 USA
jeff.piepmeier@nasa.gov

SMOS measurements of RFI

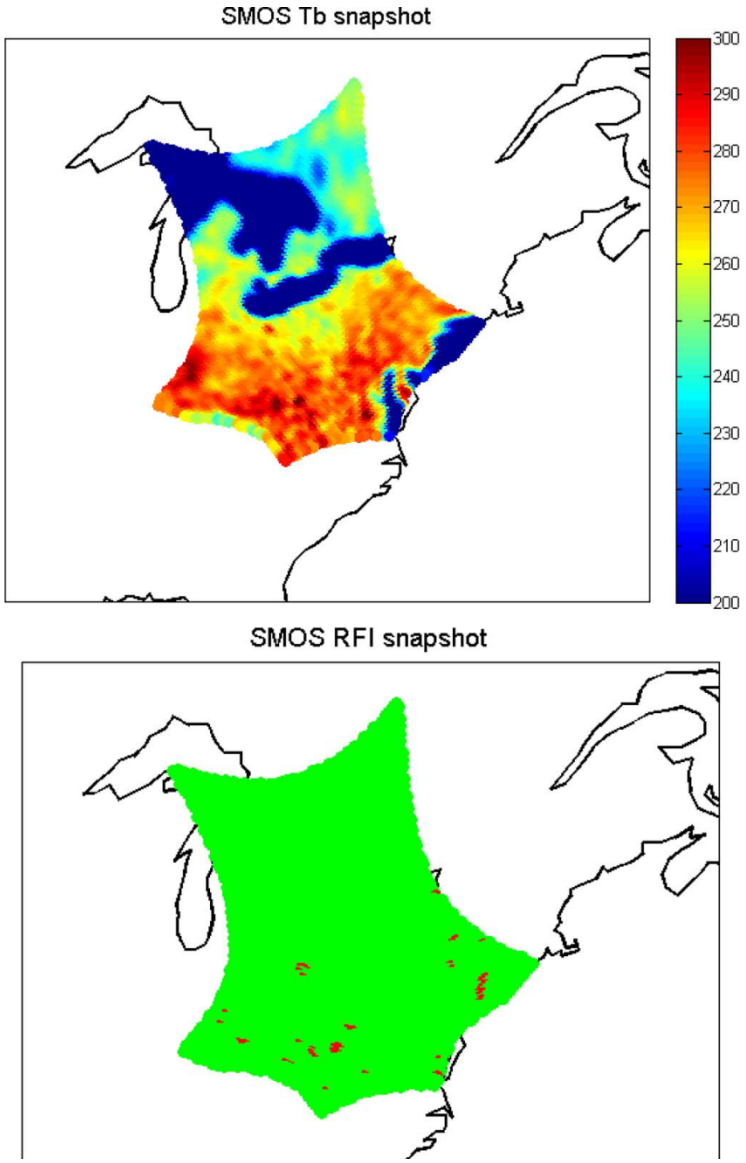


Fig. 10. (a) SMOS H-pol Tb snapshot over the eastern U.S. at 10:50:36 Coordinated Universal Time (UTC) on July 8, 2010.
(b) SMOS RFI snapshot at the same time over eastern U.S.
(red = RFI present and green = RFI free).

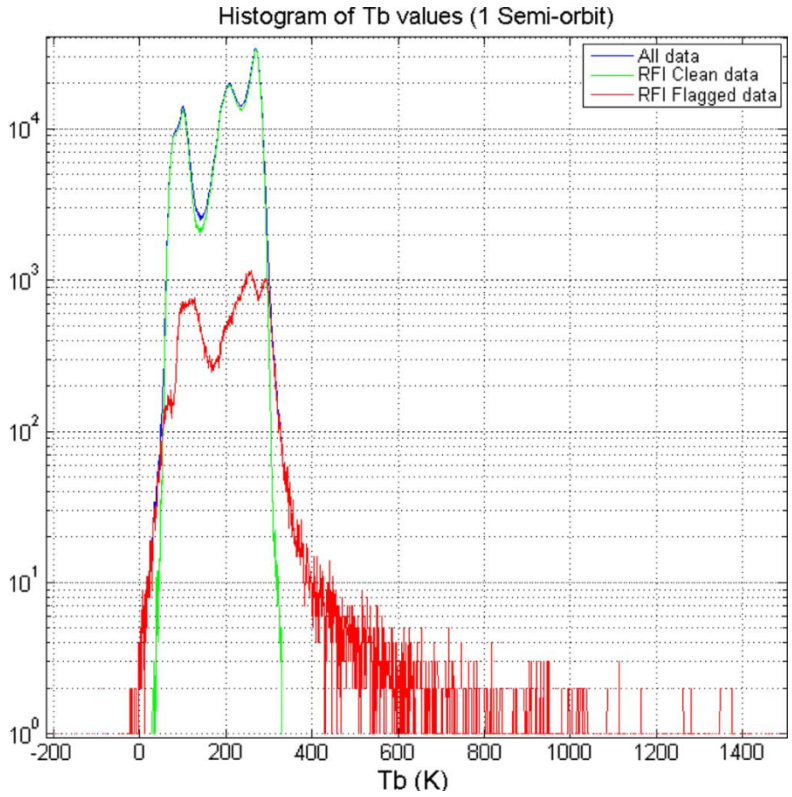
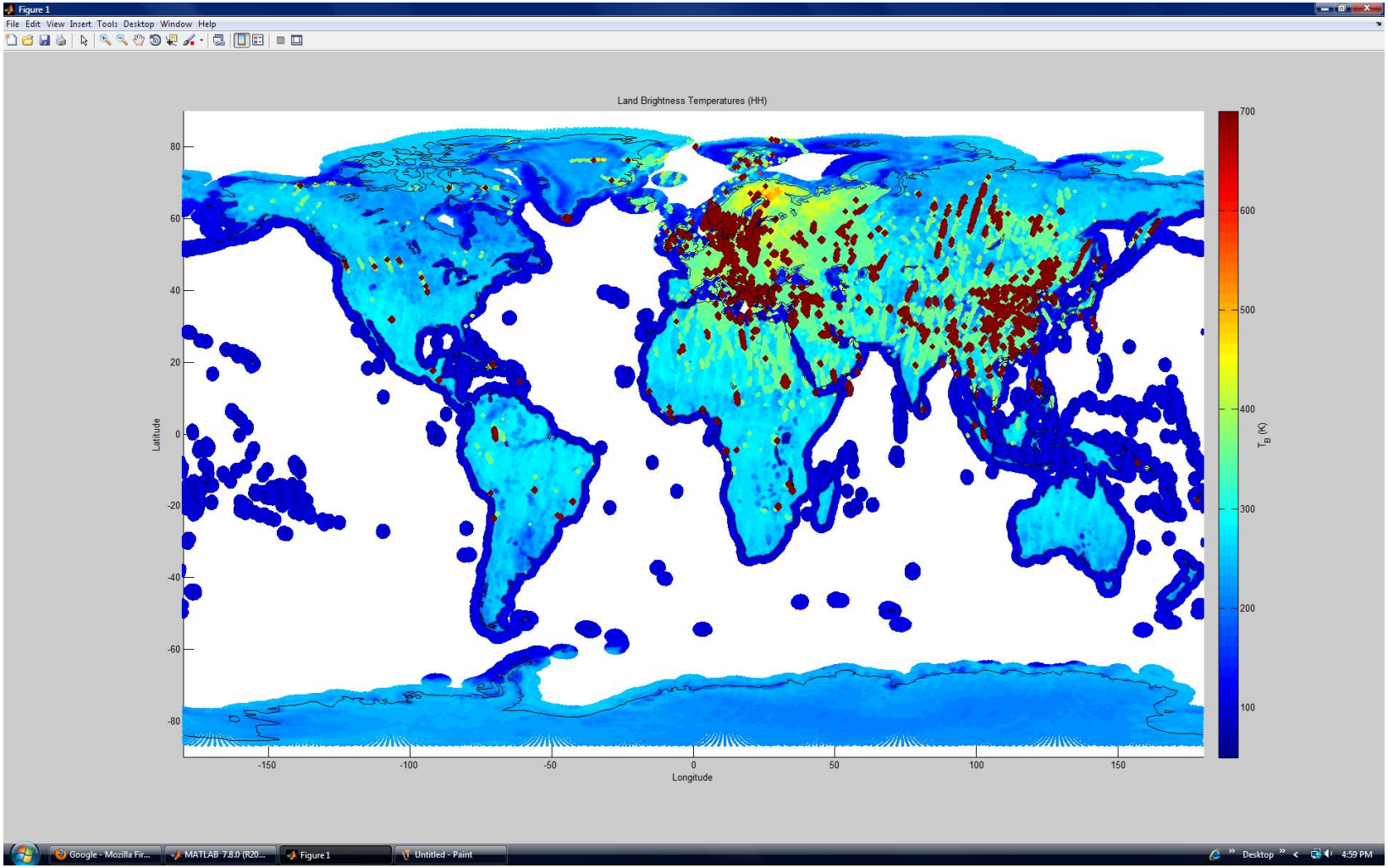


Fig. 11. Histogram of Tb values over a single half orbit, sweeping from the south to the north pole between 17◦ *W and* 95◦ *W approximately, measured* on July 8, 2010, from 10:10 to 11:05 UTC.
(Blue = All Tb data, Green =RFI free Tb data, and
Red = RFI corrupted Tb data).

Figures drawn from
Analysis of Radio Frequency Interference Detection Algorithms in the Angular Domain for SMOS
Sidharth Misra, *Member, IEEE, and Christopher S. Ruf, Fellow, IEEE*

SMOS "Peak Hold" Detected RFI Image Land V-Pol during 5-11 June 2010



MichiganEngineering
Department of
Atmospheric, Oceanic and Space Sciences

Backup Slides

University of MICHIGAN

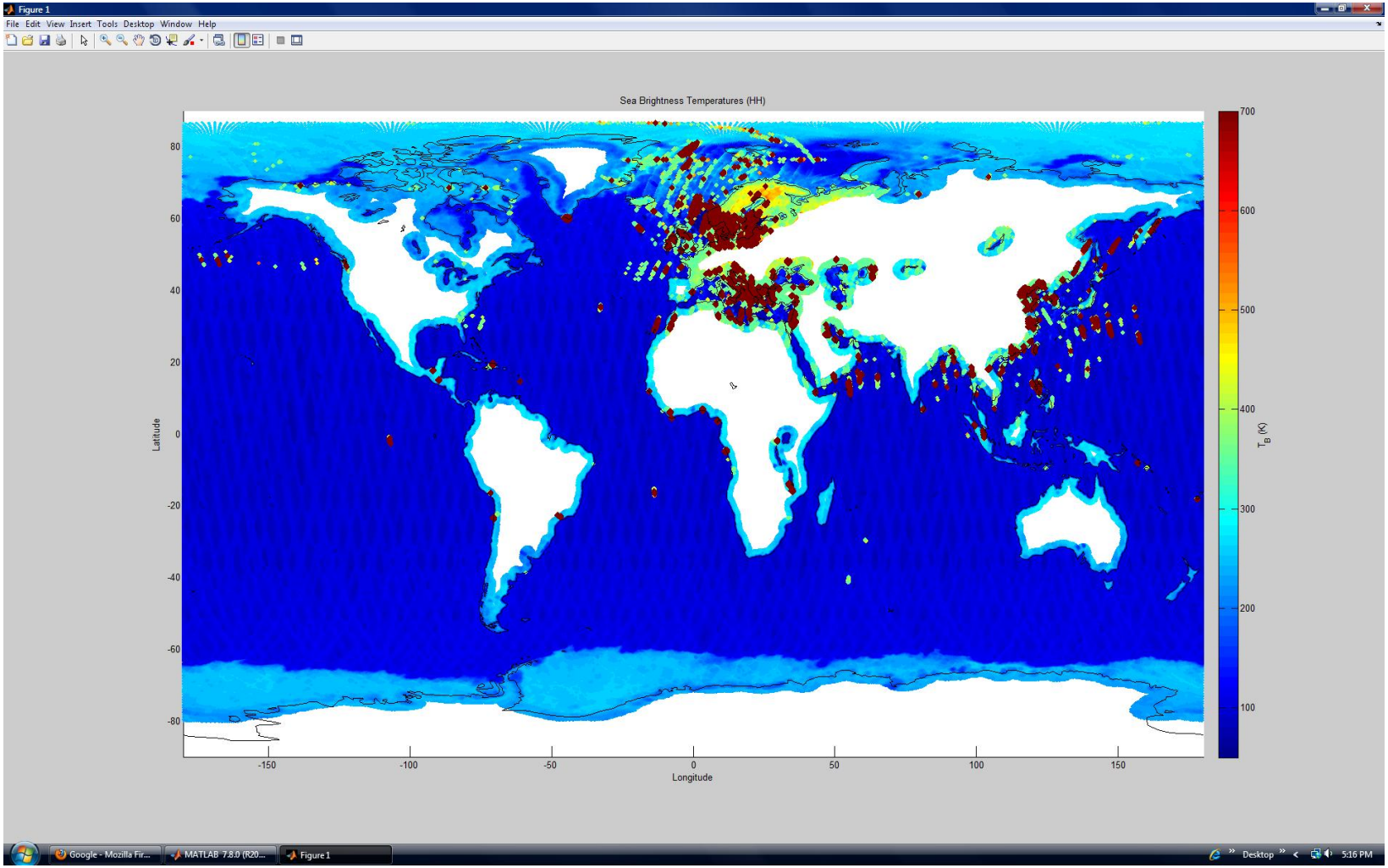
College of Engineering
Department of Atmospheric, Oceanic & Space Sciences

Aquarius/SAC-D Science Meeting
Seattle, WA
19-22 July 2010

Aquarius Radiometer RFI Algorithm

Chris Ruf
Space Physics Research Laboratory
Dept. of Atmospheric, Oceanic & Space Sciences
University of Michigan
cruf@umich.edu, 734-764-6561 (V), 734-936-0503 (F)

SMOS "Peak Hold" Detected RFI Image Ocean V-Pol during 5-11 June 2010



MichiganEngineering
Department of
Atmospheric, Oceanic and Space Sciences