

# SOLAR EFFECTS IN WACCM WACCM5 UPDATE

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DOUG KINNISON,



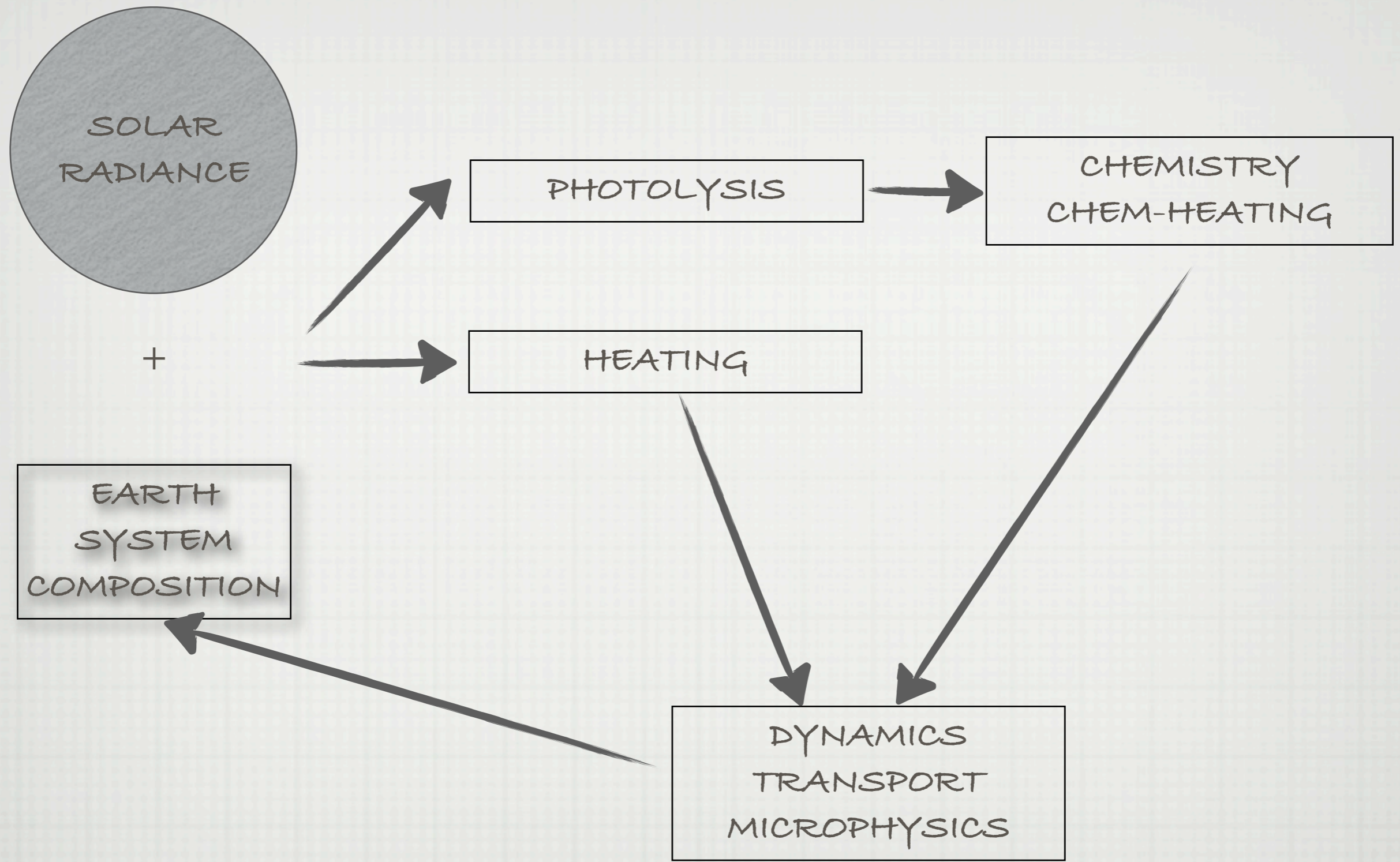
SciDAC

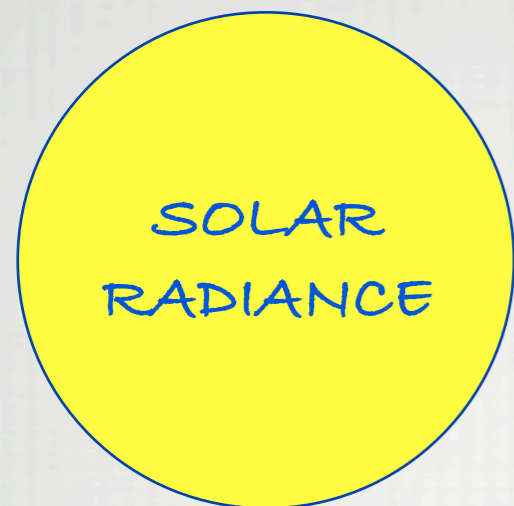
Scientific Discovery through Advanced Computing



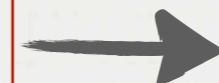
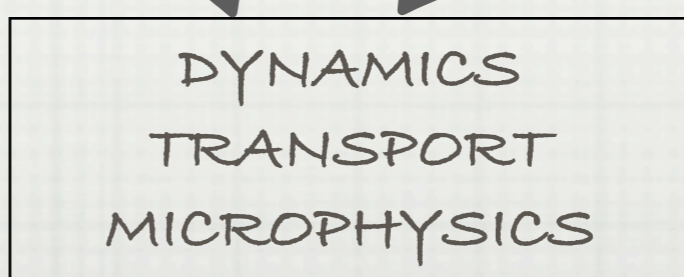
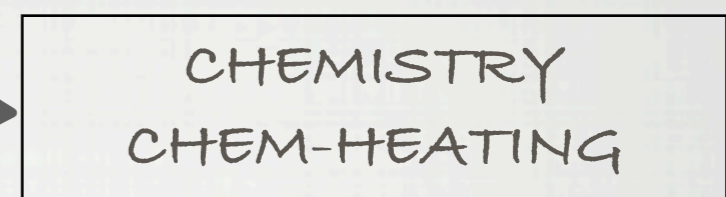
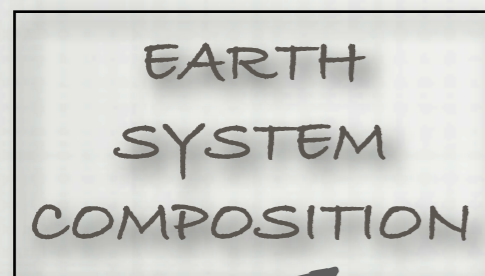
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# SOLAR STANDARDS

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- RRTMG: KURUCZ-1998 (WHAT VERSION?)
- WACCM PHOTOLYSIS PACKAGE STANDARD
- LEAN (2008) [CURRENT RTMIP]
- SRPM FROM JUAN FONTENLA (1999, 2009, 2011)
  - OBS: PSPT
  - SOLAR RT MODEL FOR EACH SURFACE FEATURE
  - CONSISTENT WITH SORCE SATELLITE (SOLSTICE/SIM)

# SOLAR STANDARDS

IGNORE

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# SPECTRAL IRRADIANCE / CLIMATE

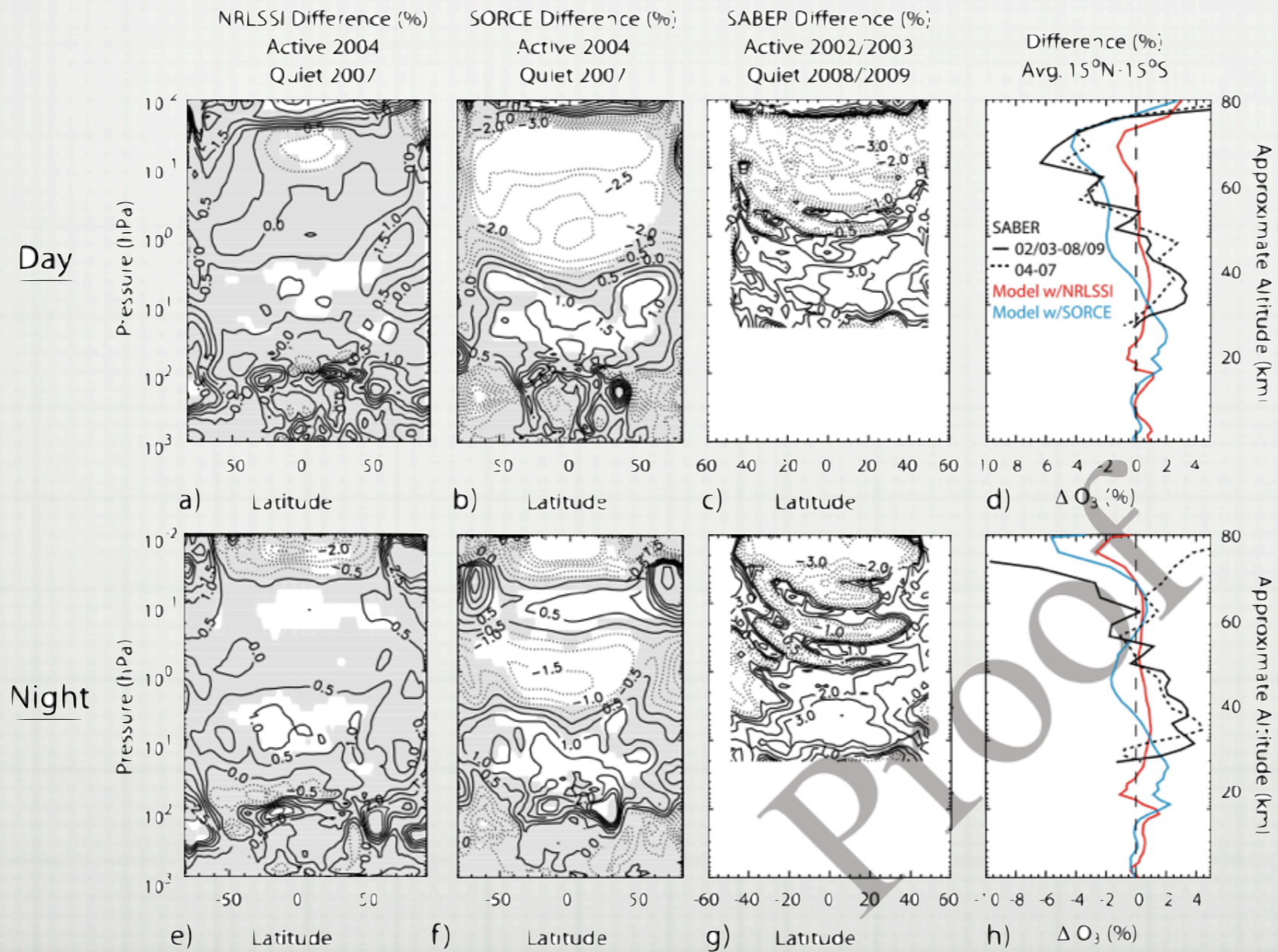
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- HARDER, J. W., J. M. FONTENLA, P. PILEWSKIE, E. C. RICHARD, AND T. N. WOODS (2009), TRENDS IN SOLAR SPECTRAL IRRADIANCE VARIABILITY IN THE VISIBLE AND 396 INFRARED, GEOPHYS. RES. LETT., 36, L07801, DOI: 10.1029/2008GL036797.
- HAIGH, J. D., ET AL. (2010), AN INFLUENCE OF SOLAR SPECTRAL VARIATIONS ON RADIATIVE FORCING OF CLIMATE, NATURE, 467, 696-699, DOI:10.1038/393
- GARCIA, R.R. 2010: ATMOSPHERIC PHYSICS: SOLAR SURPRISE?. NATURE, 467, 668-669.

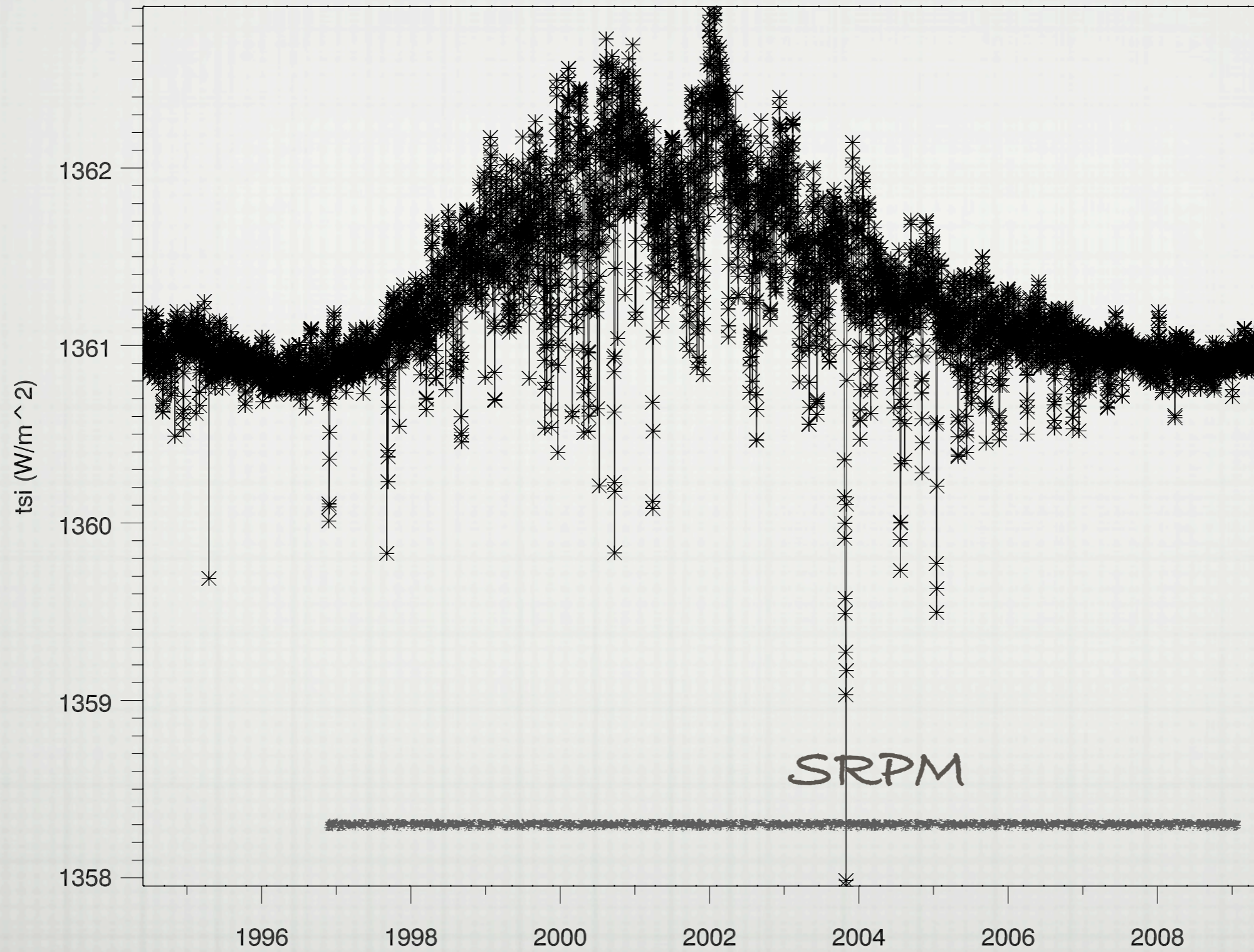
# WACCM/ SOURCE SIM

MERKEL ET AL.: IMPACT OF SSI VARIABILITY ON OZONE

LXX

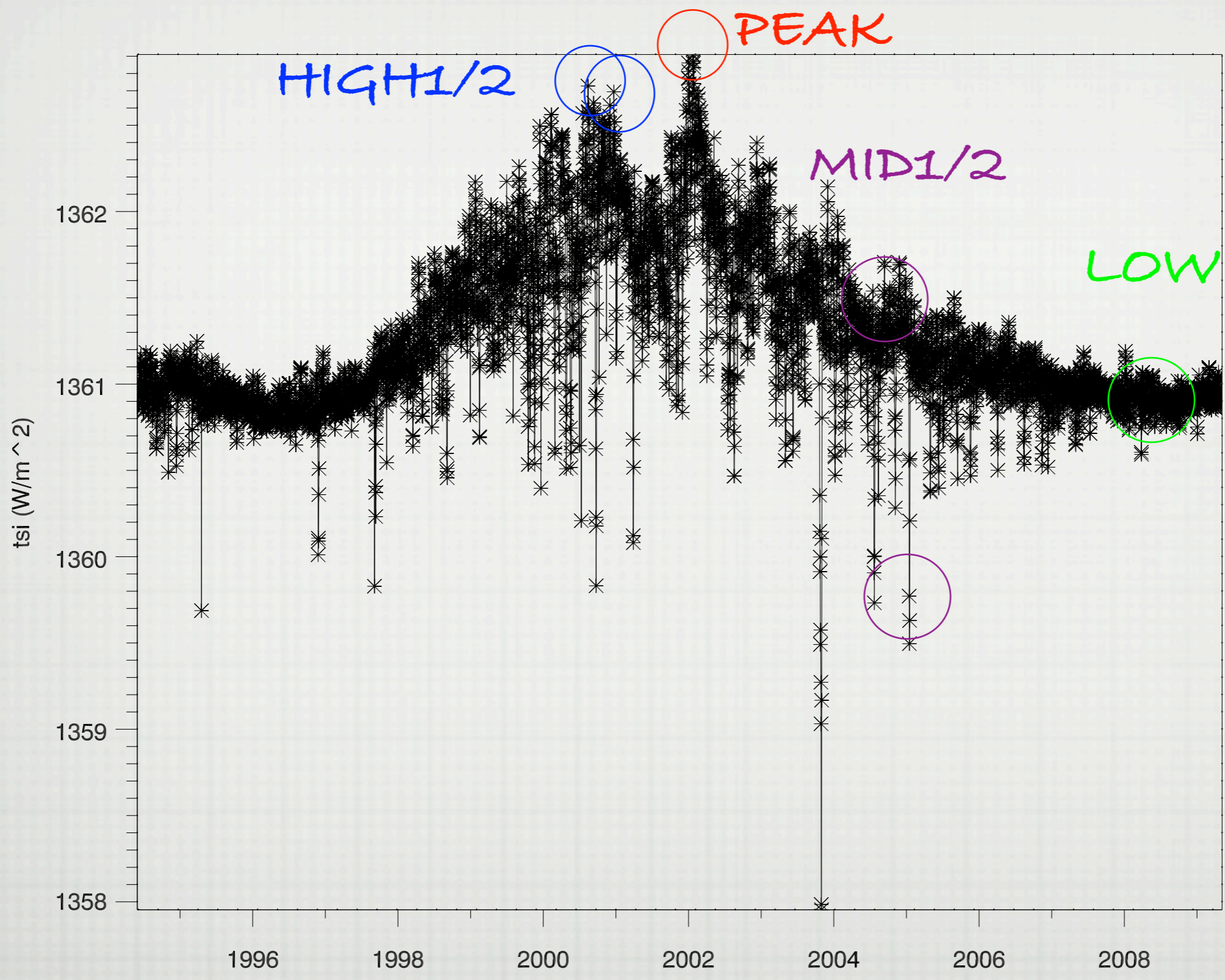


tsi [W/m<sup>2</sup>]

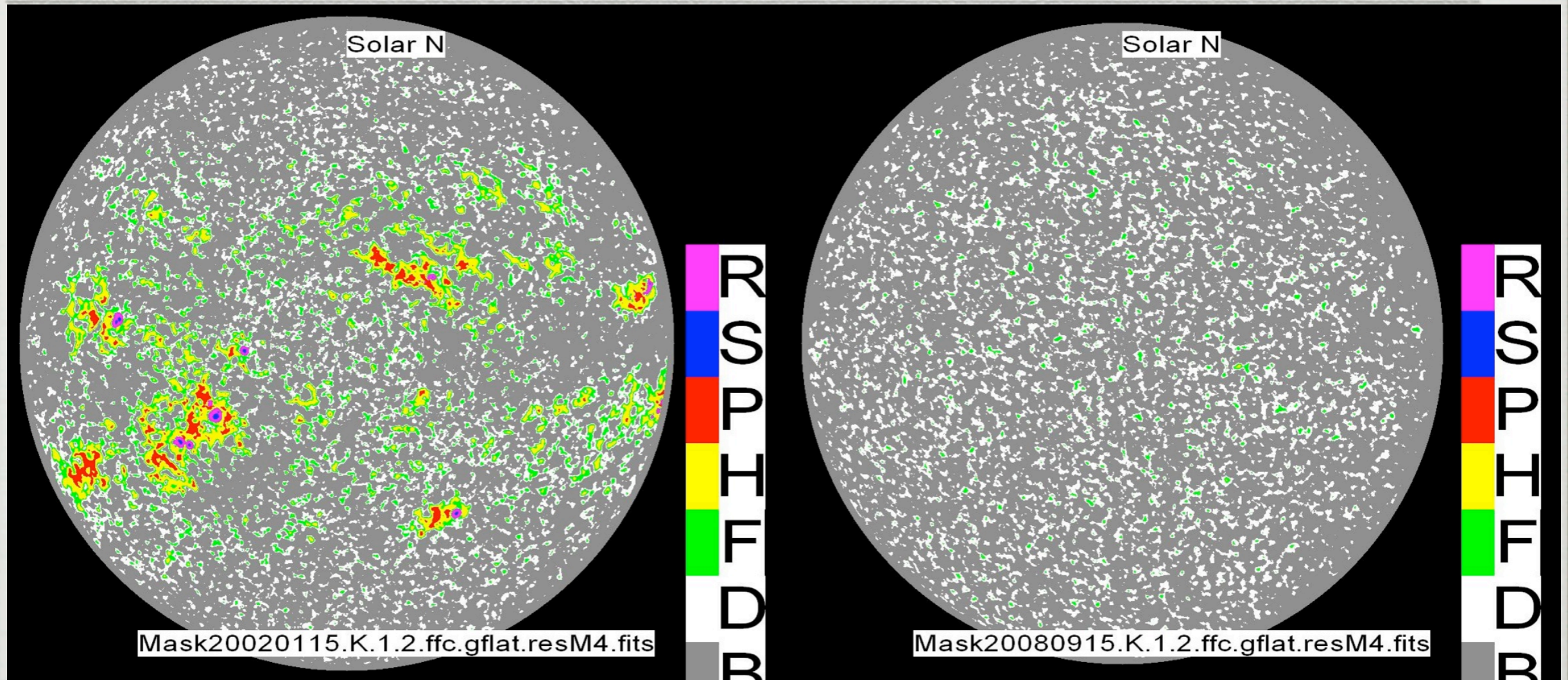




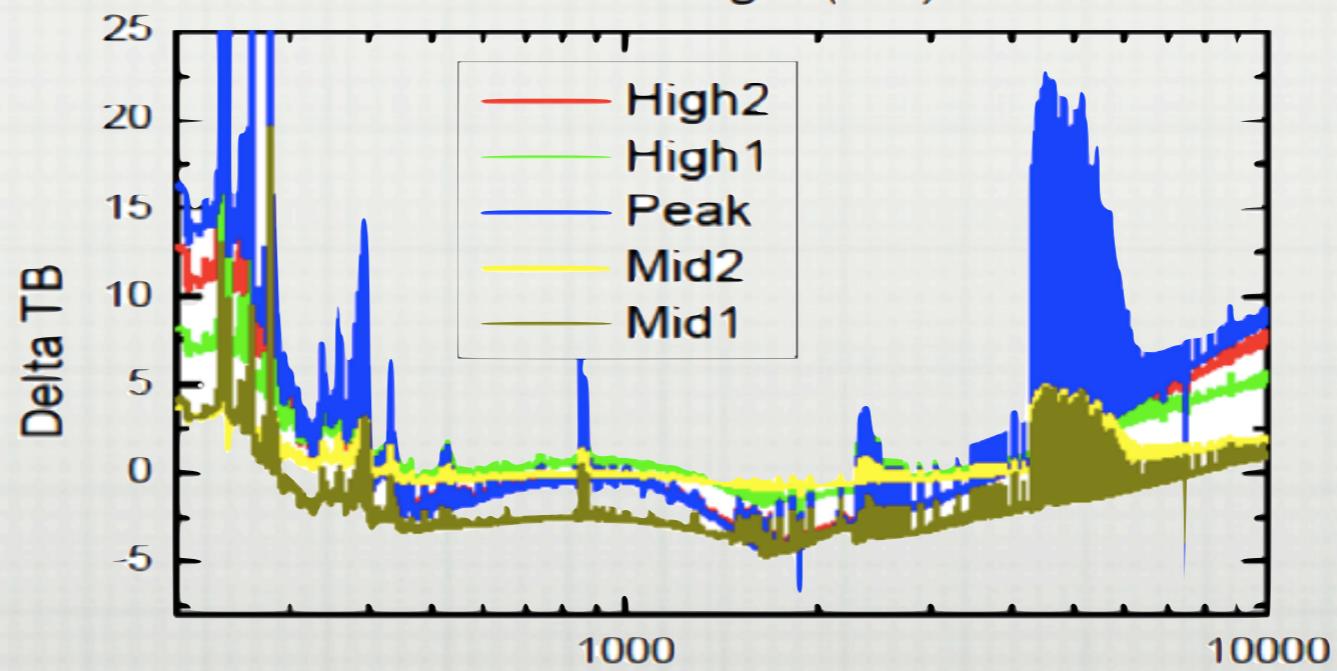
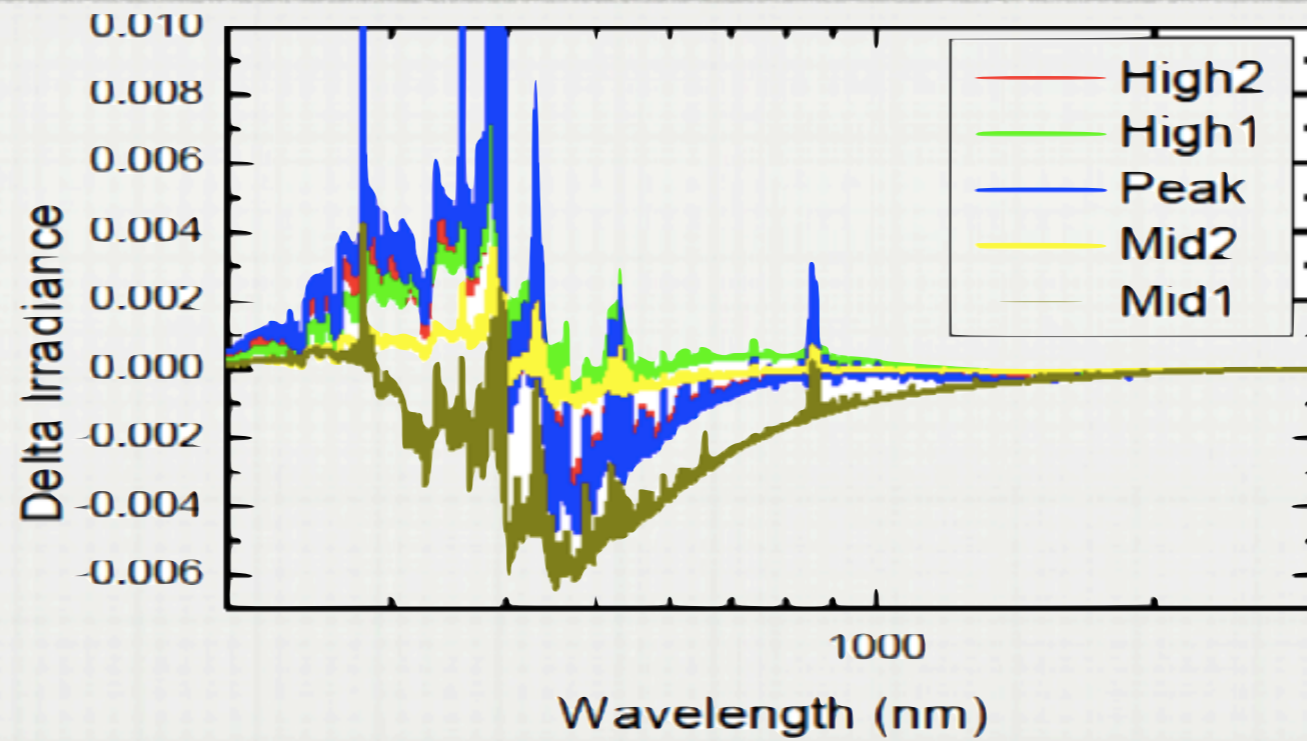
tsi [W/m<sup>2</sup>]



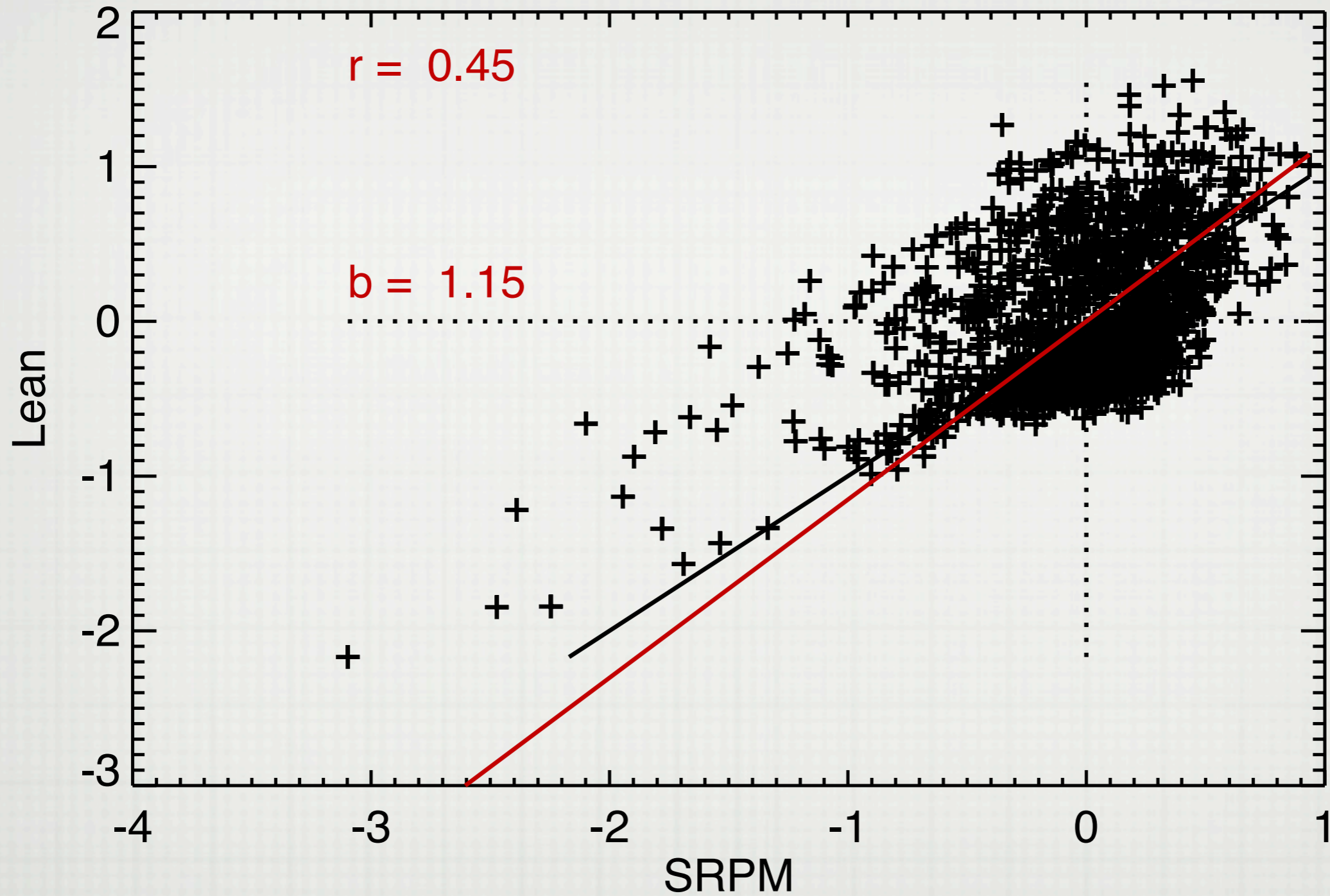
# SRPM FEATURE TYPES



# SRPM VARIANCE



# 1355.0010 W/m<sup>2</sup> TSI

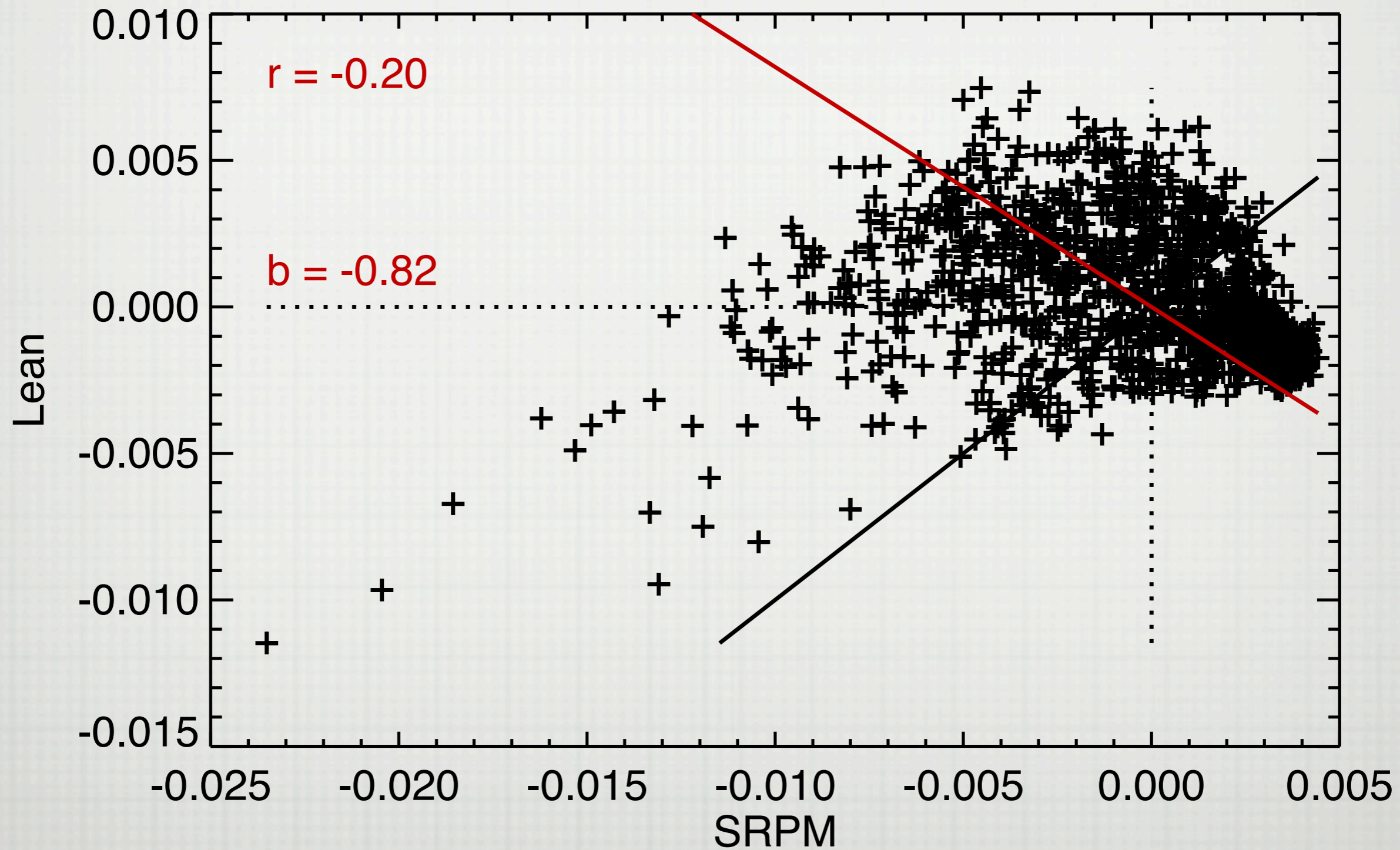


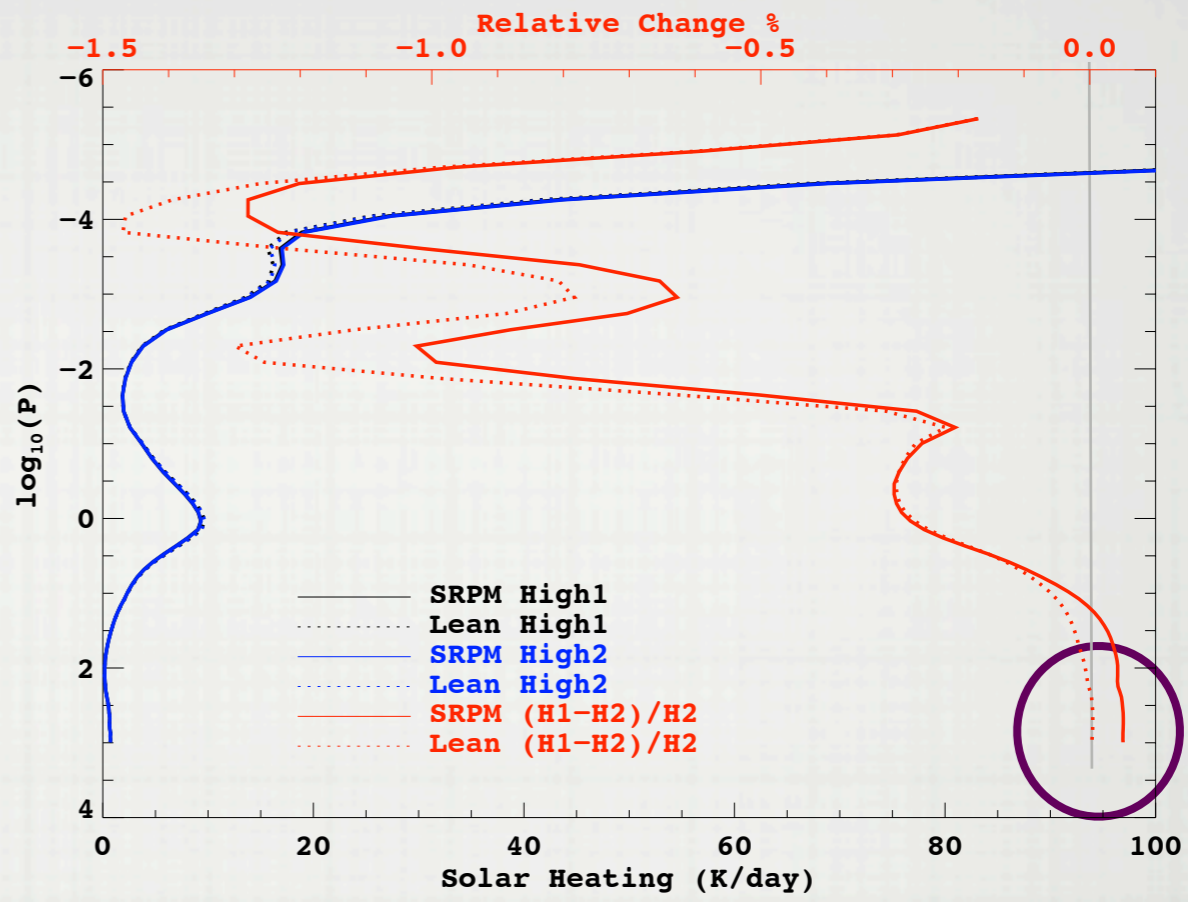
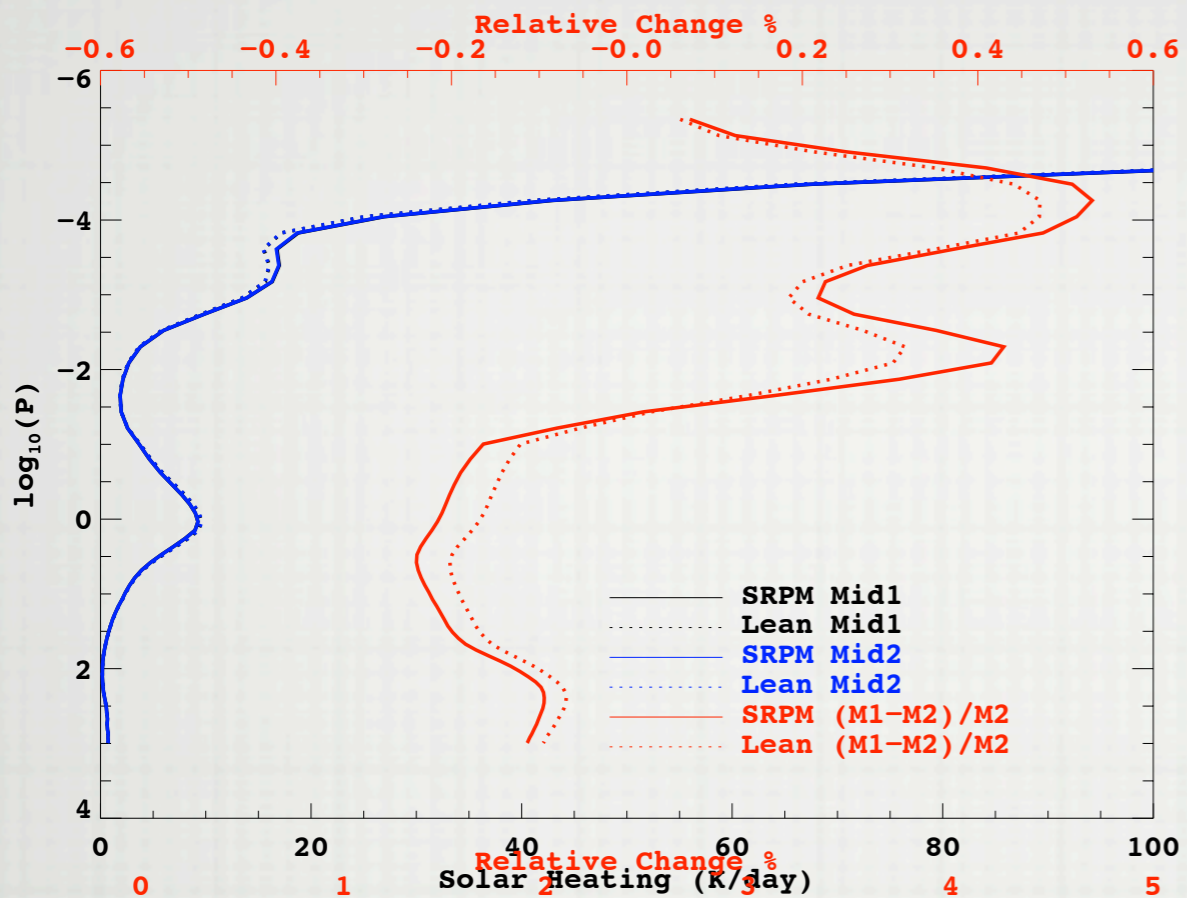
DEVIATION FROM MEAN IN W/M<sup>2</sup>

SURFACE

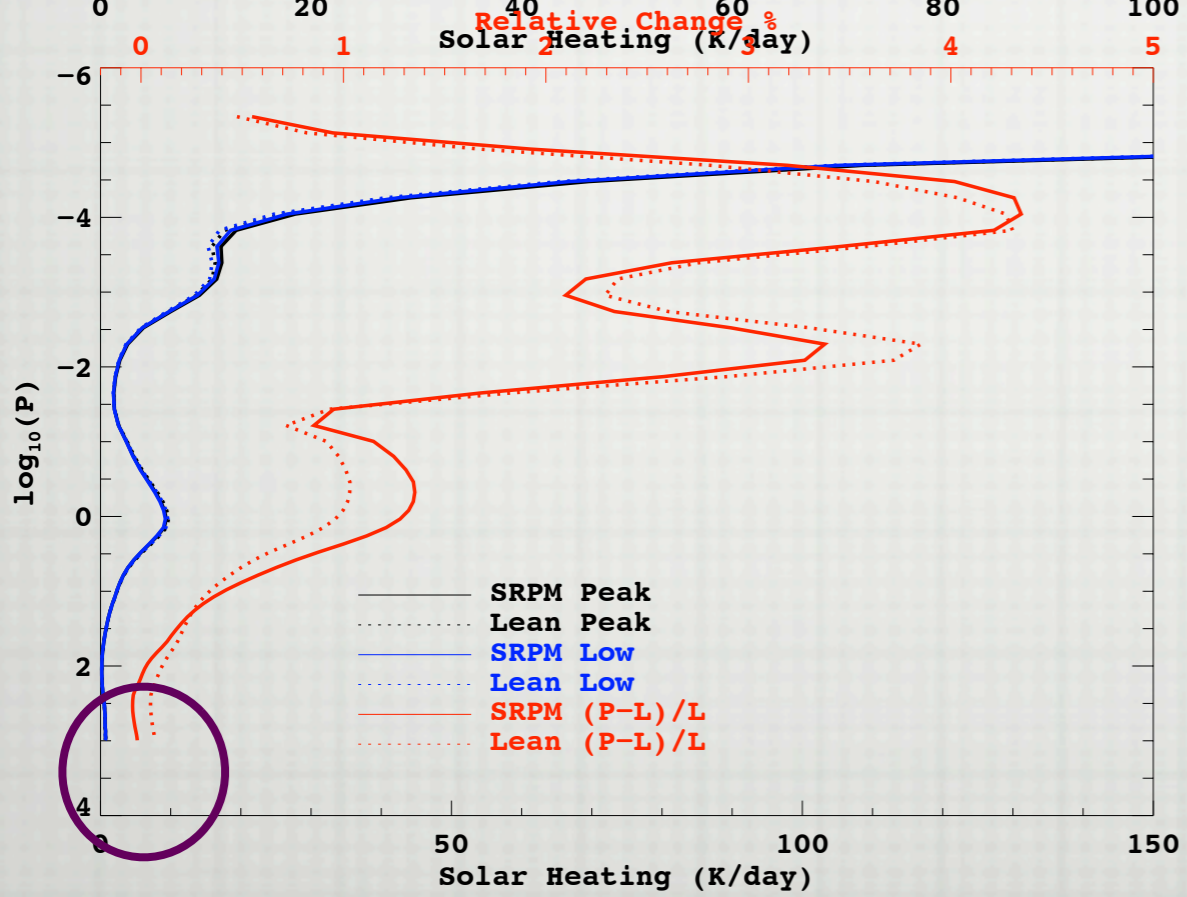
Band Center nm	Correlation	Regression Slope b	Energy W/m <sup>2</sup>	$\sigma$ (SRPM)	$\sigma$ (LEAN)
TSI	0.44	1.15	1355	0.395	0.478
231	0.95	0.89	3	0.035	0.031
303	0.89	0.54	47	0.100	0.054
393	0.86	0.67	129	0.132	0.089
533	-0.14	-0.92	343	0.181	0.139
701	0.13	1.01	217	0.068	0.072
1010	0.43	0.99	347	0.079	0.079
1270	0.05	0.95	24	0.006	0.004
1462	0.25	0.52	102	0.036	0.011
1783	0.59	0.22	55	0.021	0.004
2046	0.02	0.90	22	0.007	0.001
2325	-0.05	-0.89	23	0.005	0.002
2788	-0.20	-0.81	20	0.003	0.002
3461	0.21	0.89	11	0.001	0.001

20.147641 W/m<sup>2</sup> 2788.46nm





SIGN?



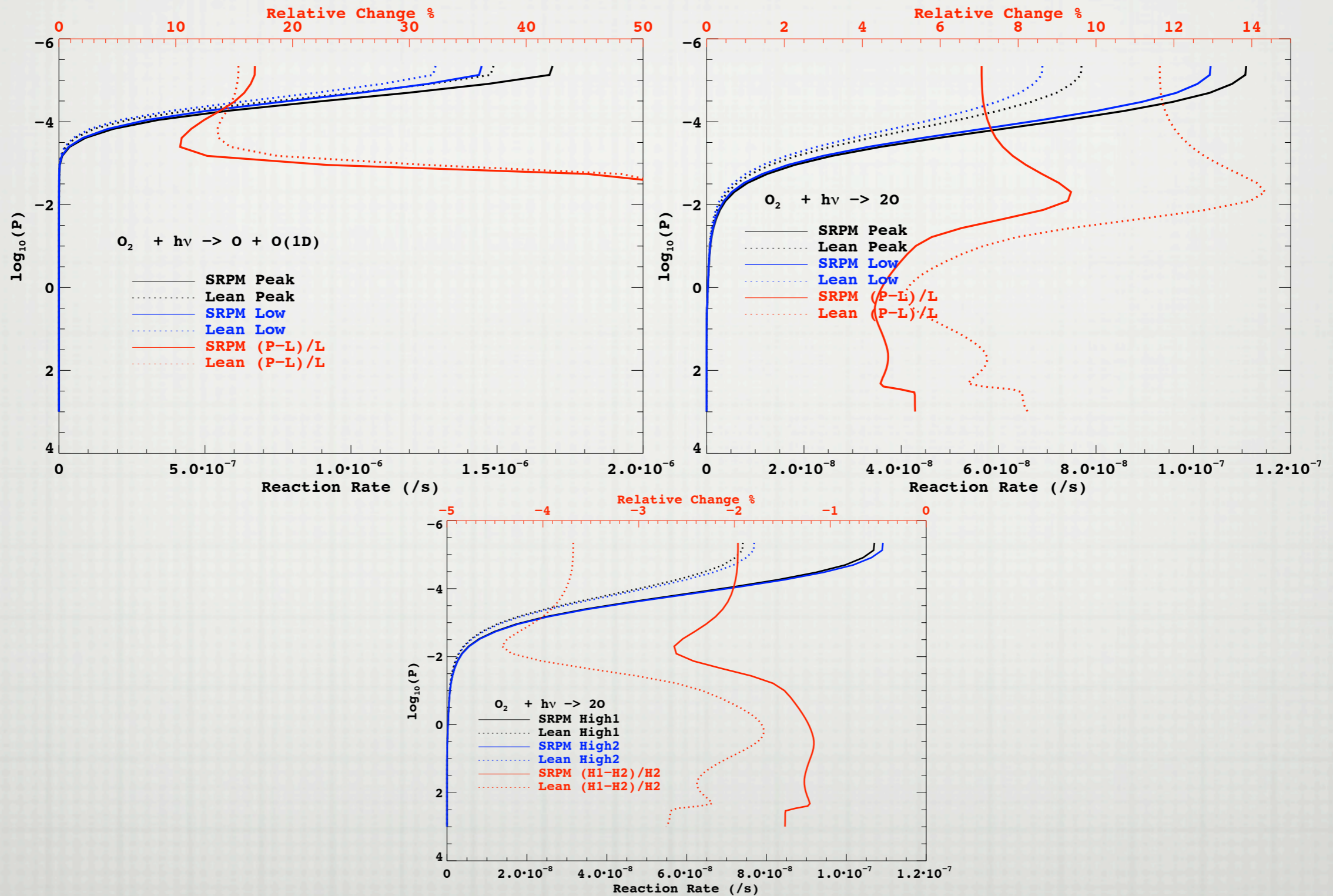
HEATING RATE  
VARIATION

# SURFACE SHORTWAVE ABSORPTION (UNCOUPLED)

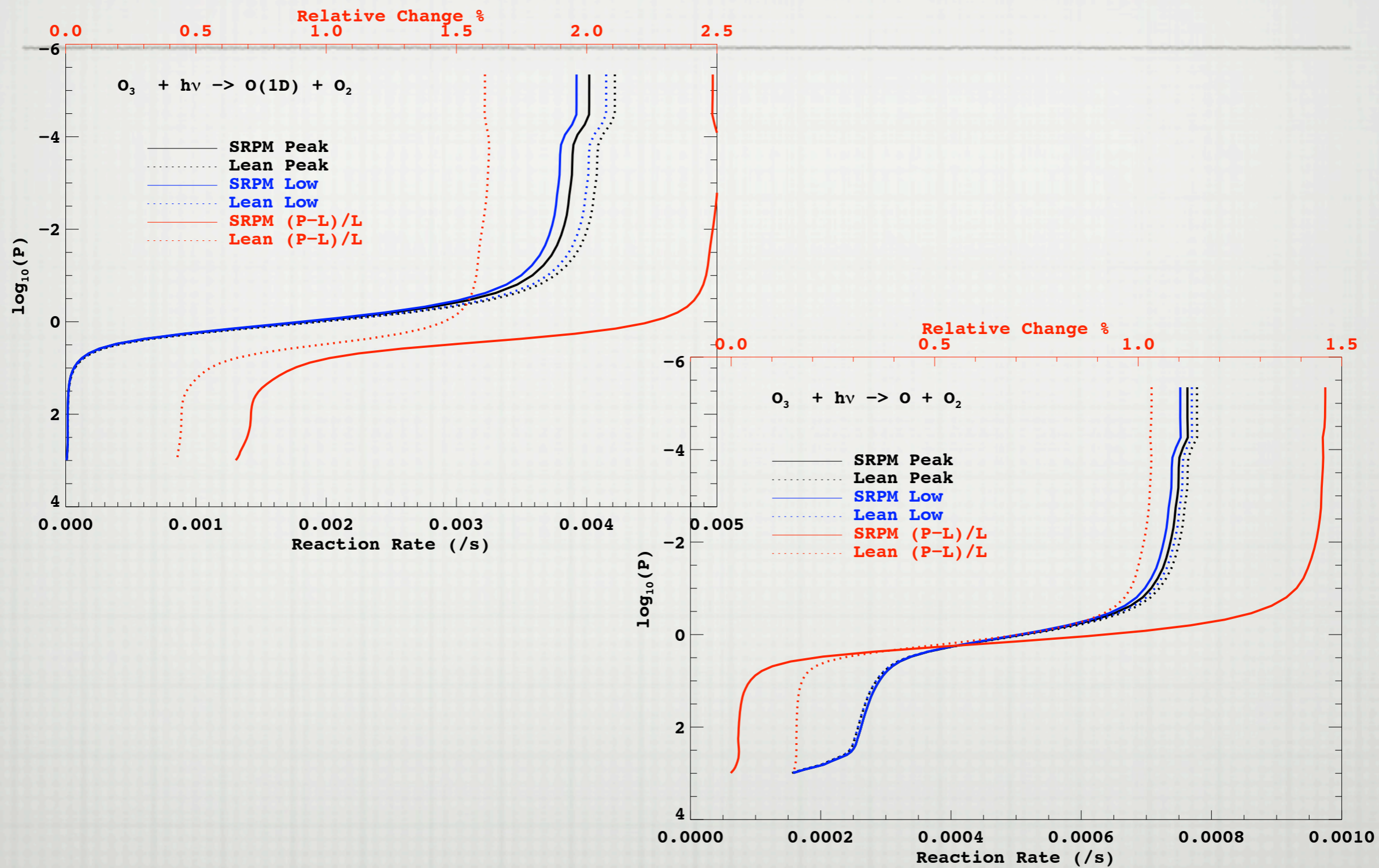
	<b>SRPM W/m<sup>2</sup></b>	<b>Lean W/m<sup>2</sup></b>
<b>peak-low</b>	<b>0.03</b>	<b>0.29</b>
<b>high2-high 1</b>	<b>-0.14</b>	<b>0.01</b>
<b>mid2-mid 1</b>	<b>-0.39</b>	<b>-0.32</b>



# O<sub>2</sub> PHOTOLYSIS



# O3 PHOTOLYSIS



# STATUS OF WACCM5

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- WORKS WITH RRTMG AND PORT
- LAST BUG MERGING RRTMG WITH LATEST CHEMISTRY
- NEXT:
  - MG MICRO/MACRO PHYSICS
  - LW BOUNDARY LAYER
  - UNIFY MAM AND CHEMISTRY