

**CONAE - MWR Science Team**

# **MWR Orbit Number User Manual**

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**COMISION NACIONAL DE  
ACTIVIDADES ESPACIALES  
ARGENTINA**



**DOCUMENT CHANGES RECORD**

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## 1 Purpose

The purpose of this document is to describe CONAE's Microwave Radiometer convention for the SACD/Aquarius orbit numbers and the correspondence with Aquarius convention.

## 2 SAC-D/Aquarius mission overview

The SAC-D/Aquarius mission is a cooperative international scientific mission developed between Comisión Nacional de Actividades Espaciales (CONAE) of Argentina and the National Aeronautics and Space Administration (NASA) of United States of America, which includes instrument contributions from Agenzia Spaziale Italiana (ASI), Centre National d'Etudes Spatiales (CNES), and the Canadian Space Agency (CSA). The SACD service platform was provided by CONAE and the launch was on June 10th 2011 (provided by NASA), from Western Test Range (WTR) at Vandenberg Air Force Base (VAFB). On board SAC-D/Aquarius there are 8 instruments. Aquarius, the main instrument, comprises a passive microwave radiometer operating in the protected "radio astronomy" frequency band at  $1.413GHz$  and an scatterometer in the space-radar frequency band at  $1.26GHz$ . The measurement of L-band brightness temperature by the Aquarius radiometer is the primary means for remote sensing SSS, and the ocean backscatter measurements from the scatterometer provides a critical roughness correction for the passive SSS retrievals. In addition, the MicroWave Radiometer called MWR, operating at K (single polarized) and Ka (dual polarized) bands, measures the surface brightness temperature in the frequency range sensitive to geophysical parameters over the ocean such as surface wind speed, rain rate, water vapor, cloud liquid water and sea ice concentration. MWR geophysical retrievals provides critical corrections to the Aquarius instrument for accurate sea surface salinity estimates. Under CONAE's supervision, MWR was entirely designed and built in Argentina at the Instituto Argentino de Radioastronomía (IAR) under the authority of the Consejo Nacional de Investigaciones Científicas (CONICET), and the Grupo de Ensayos Mecánicos Aplicados (GEMA), under the authority of the Departamento de Aeronáutica de la Universidad Nacional de La Plata (UNPL).

SAC-D/Aquarius mission focuses on understanding the interaction between the global water cycle, ocean circulation and climate through the measurement of sea surface salinity (SSS). In addition, this mission objective is to provide data of ocean salinity, ocean winds, rain, sea ice, sea surface temperature, soil moisture, high temperature events (fires and volcanic activities), nighttime light sources, atmospheric temperature/humidity/pressure, and space environment, distributing also autonomous data acquired from remote ground stations.

Figure 2.0.0.-1 shows the schematic representation of the spacecraft. The SAC-D/Aquarius orbit can be summarize:

- Type: sun-synchronous.
- Global coverage: 7 days.
- Altitud: 657 km
- Orbit period:  $\approx$  97 minutes 52 seconds (14 to 15 orbits per day, 103 orbits per week).
- Ascending node: 6 pm.

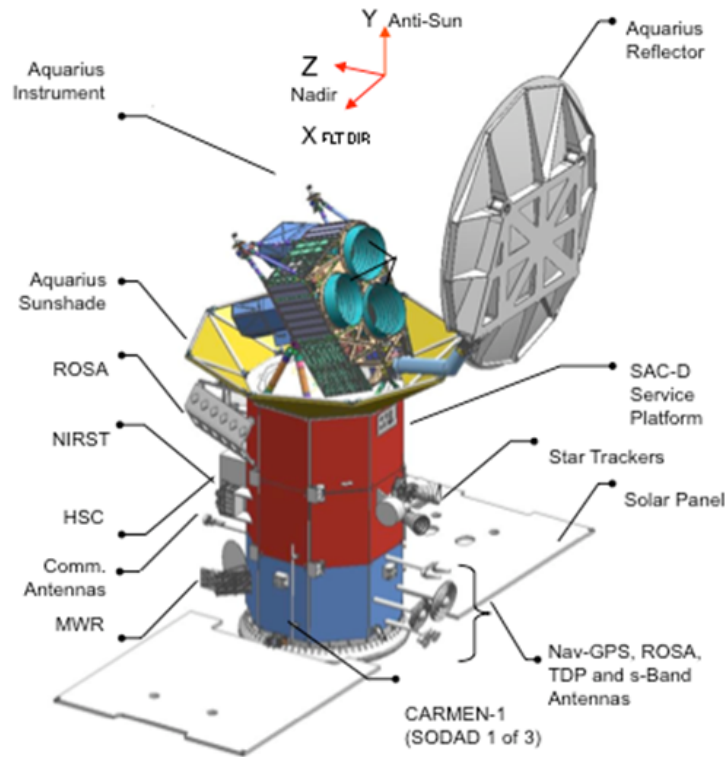


Figure 2.0.0.-1: The SAC-D/Aquarius spacecraft.

### 3 MWR orbit number vs. Aquarius orbit number

SACD/Aquarius orbit period is ~ 97 minutes 52 seconds, we have 14 to 15 orbits per day and 103 orbits per week. Since the global coverage is 7 days, we have a total of 103 orbits into the total cycle.

In MWR convention, each orbit is numbered according geographical proximity, such as two consecutive orbit numbers corresponds to two consecutive geographical regions on the map. On the other hand, in Aquarius convention, each orbit is numbered increasingly according temporal criteria. So, orbit number 1 is the first orbit into the total cycle and orbit number 103 is the last. In the next table is shown the equivalence between the two nomenclatures.

MWR orbit number	Aquarius orbit number
1	100
2	41
3	85
4	26
5	70
6	11
7	55
8	99
9	40
10	84
11	25
12	69
13	10
14	54
15	98
16	39
17	83
18	24
19	68
20	9
21	53
22	97
23	38
24	82
25	23
26	67
27	8
28	52
29	96
30	37
31	81
32	22
33	66
34	7

MWR orbit number	Aquarius orbit number
35	51
36	95
37	36
38	80
39	21
40	65
41	6
42	50
43	94
44	35
45	79
46	20
47	64
48	5
49	49
50	93
51	34
52	78
53	19
54	63
55	4
56	48
57	92
58	33
59	77
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67	17
68	61
69	2
70	46

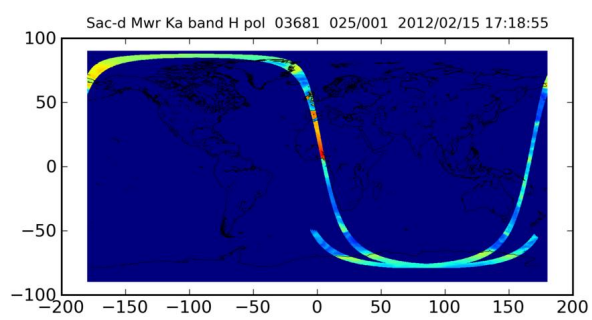
MWR orbit number	Aquarius orbit number
71	90
72	31
73	75
74	16
75	60
76	1
77	45
78	89
79	30
80	74
81	15
82	59
83	103
84	44
85	88
86	29
87	73
88	14
89	58
90	102
91	43
92	87
93	28
94	72
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97	101
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99	86
100	27
101	71
102	12
103	56

### **3.1 Associated metadata**

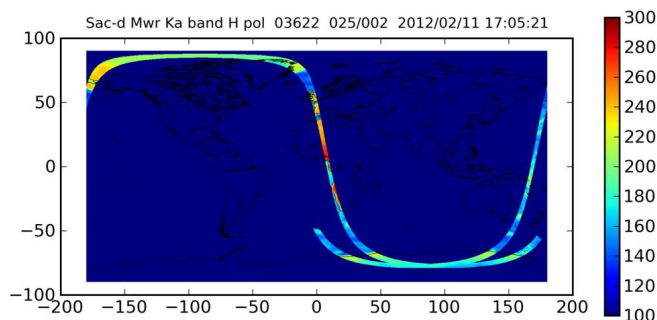
In /Global Metadata/Acquisition/ there are four attributes in order to define the orbit number in equivalent ways:

- Orbit Number: is the number of orbits elapsed since the satellite was launched. Orbit Number=1 is the first satellite orbit.
- Cycle Number: is the number of orbits elapsed since MWR began to acquire data (2011/08/18 03:00:00.000) that corresponds to Orbit Number=1007. So, Cycle Number = (Orbit Number - 1007) / 103.
- Pass Number in Cycle: is the number of orbits into the cycle of 103 orbits according Aquarius convention.
- Mwr Reference System Pass Number: is the number of orbits into the cycle of 103 orbits according MWR convention.

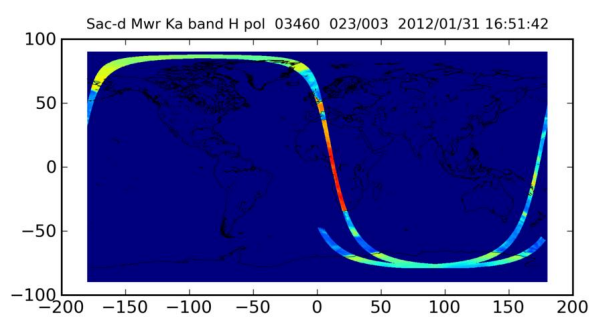
## 4 MWR orbit number catalog



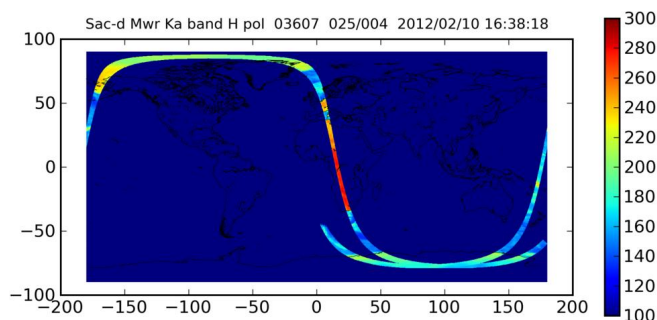
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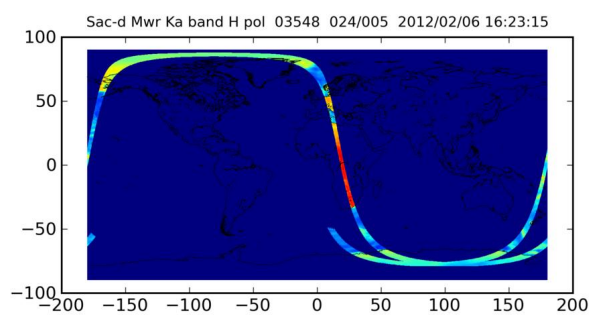
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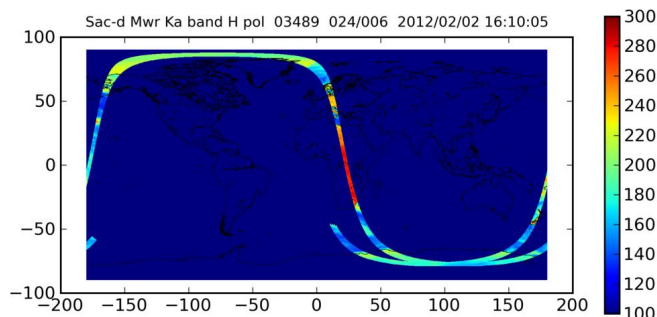
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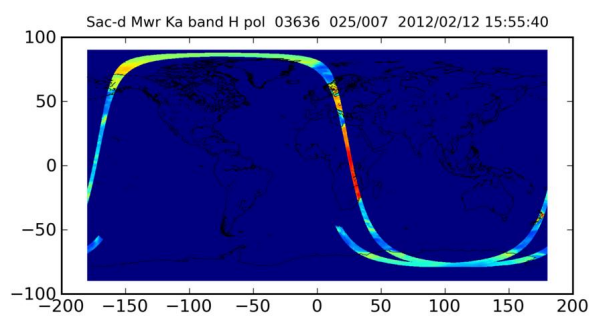
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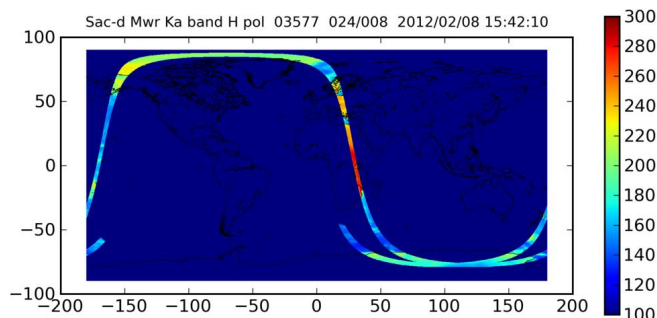
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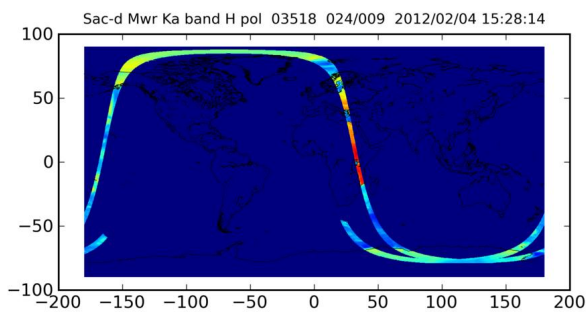
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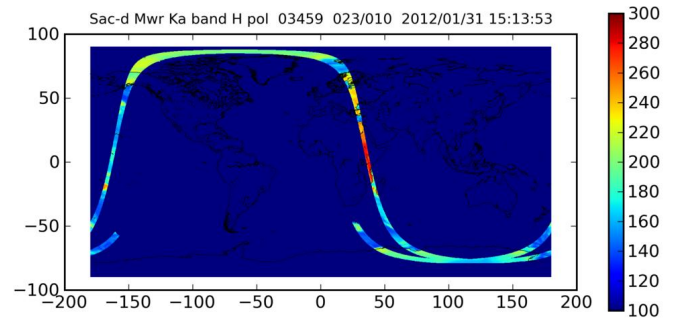
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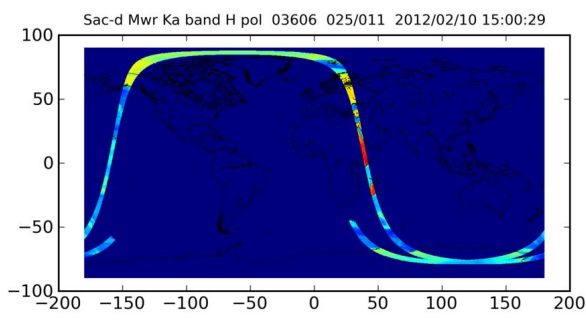
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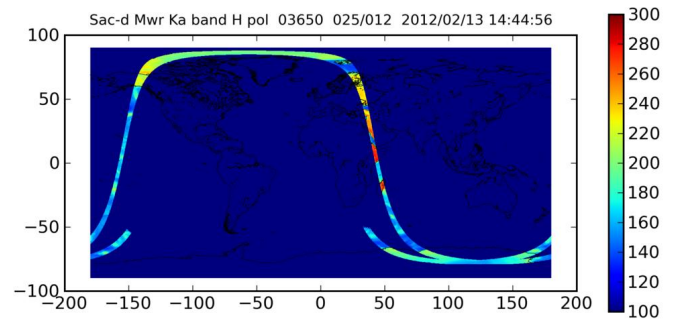
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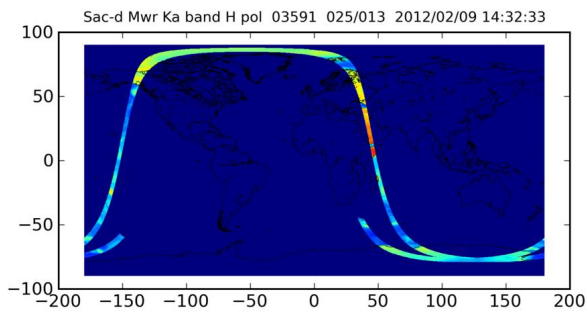
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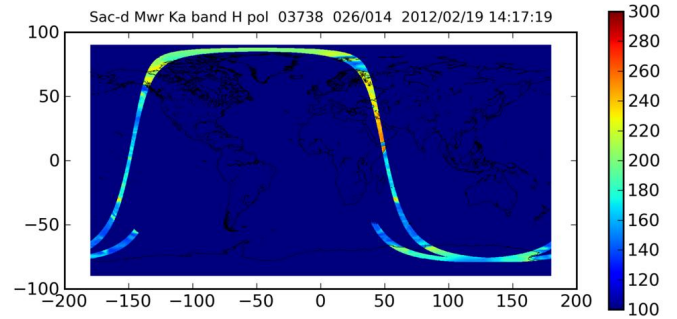
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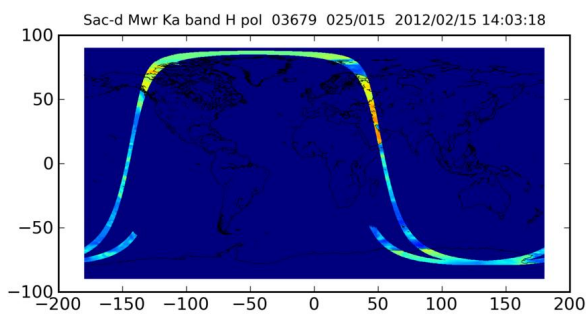
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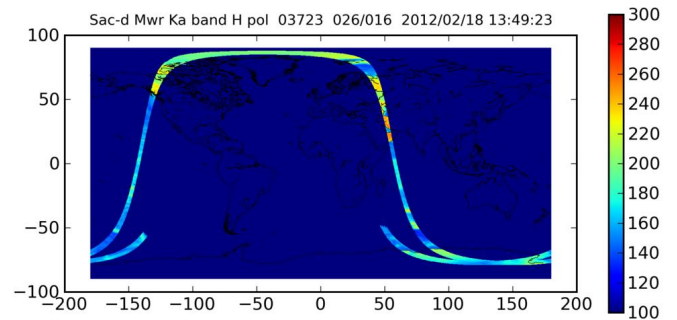
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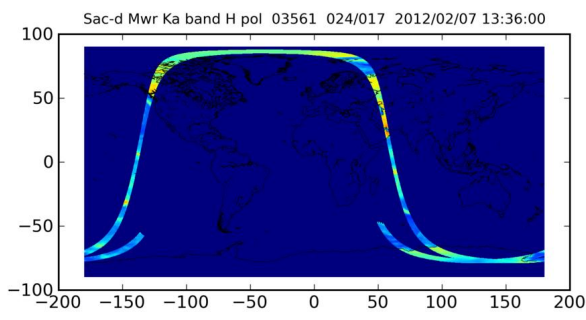
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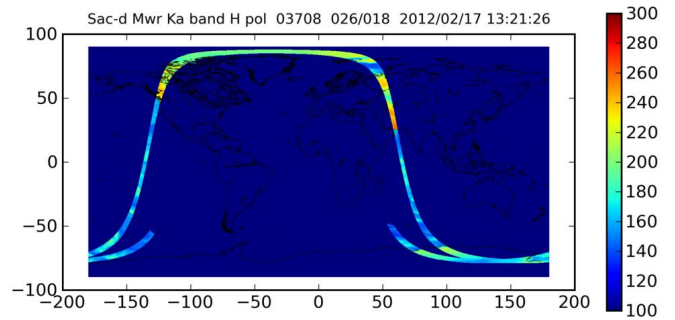
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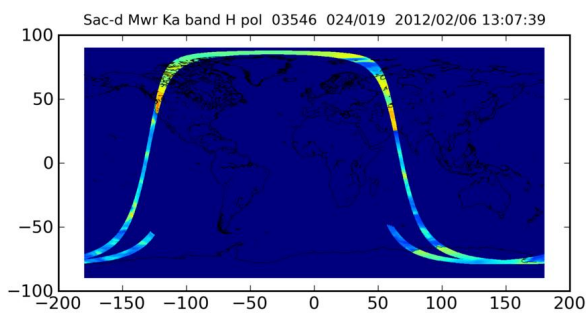
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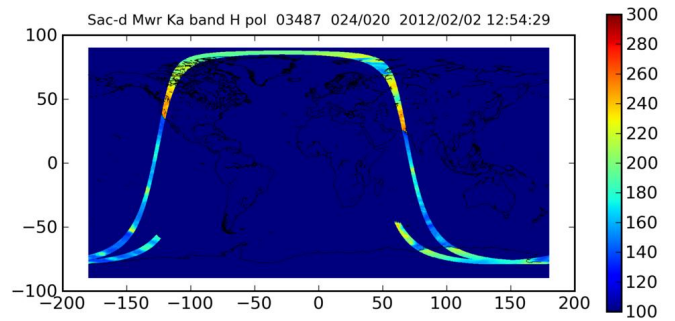
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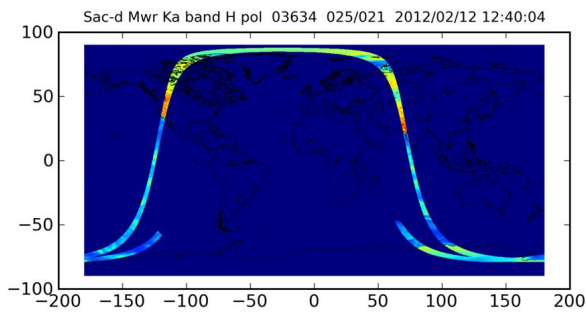
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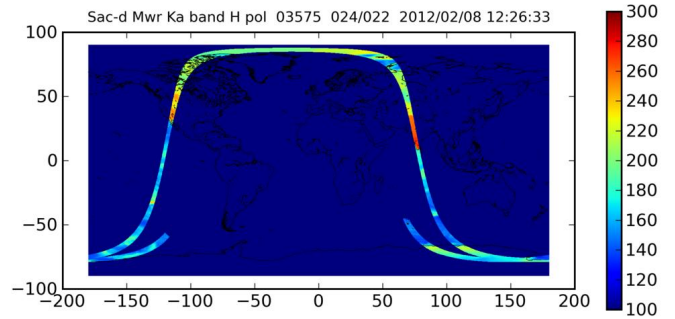
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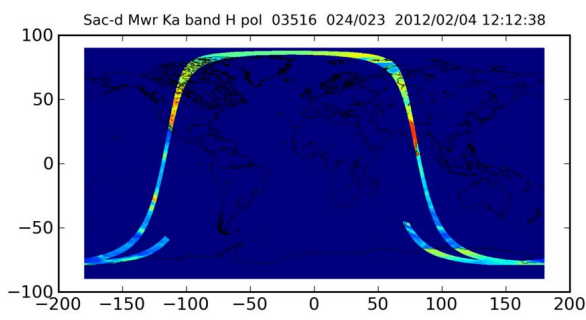
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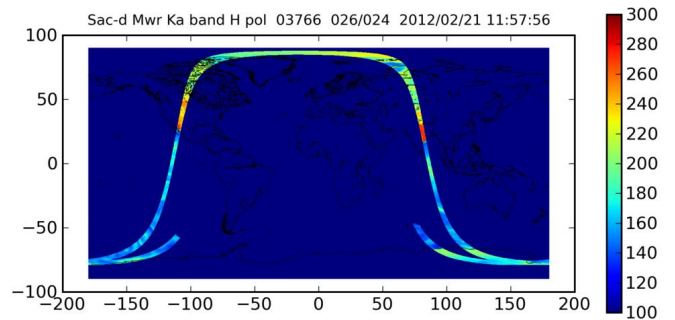
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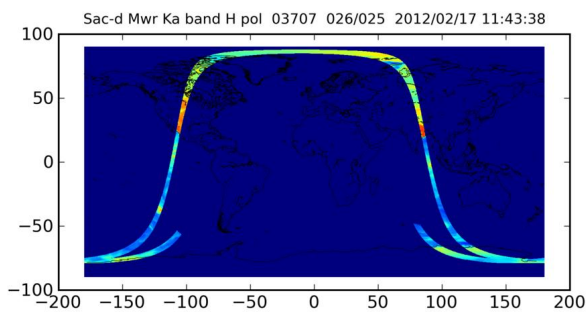
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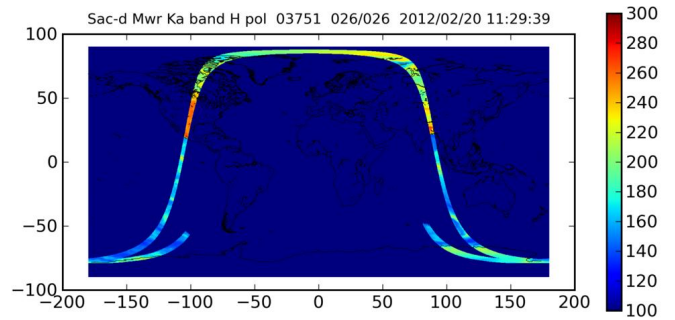
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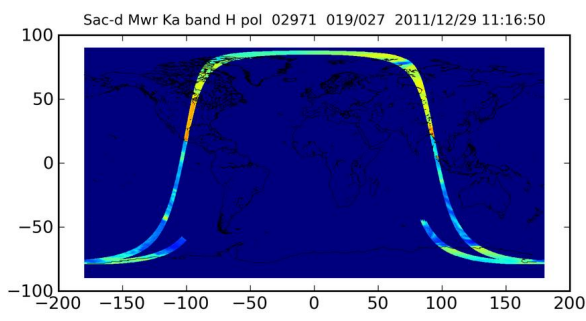
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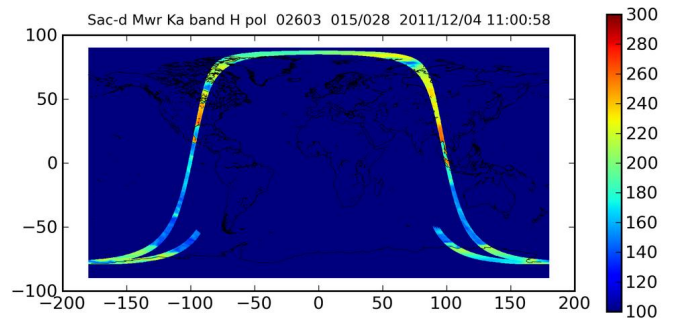
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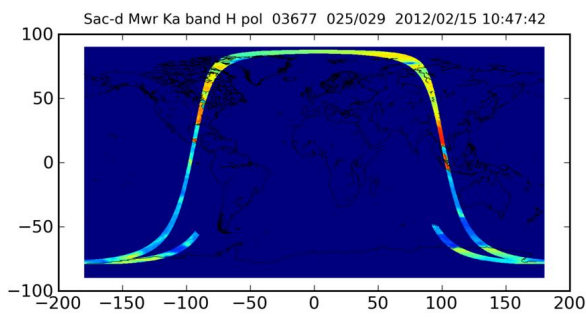
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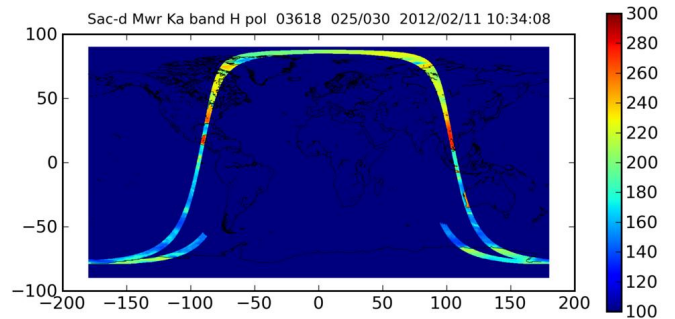
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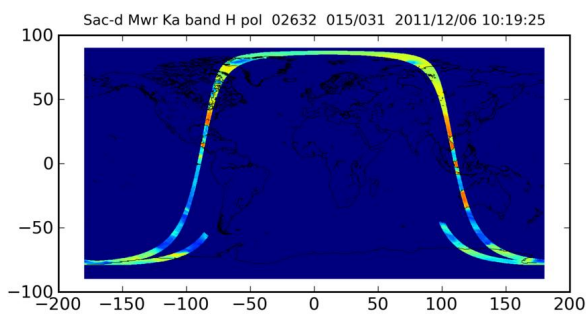
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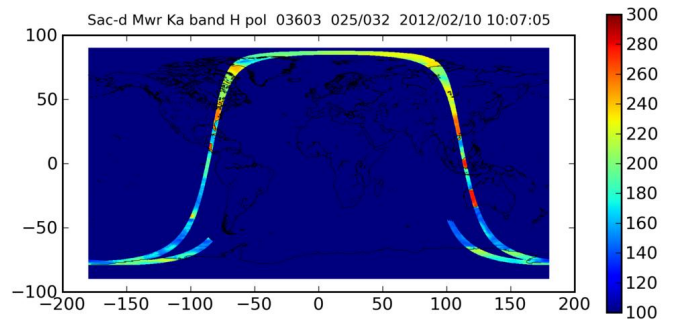
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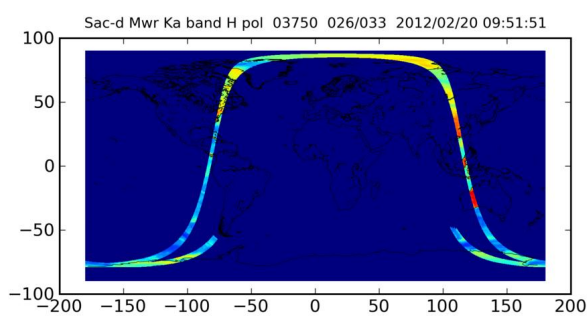
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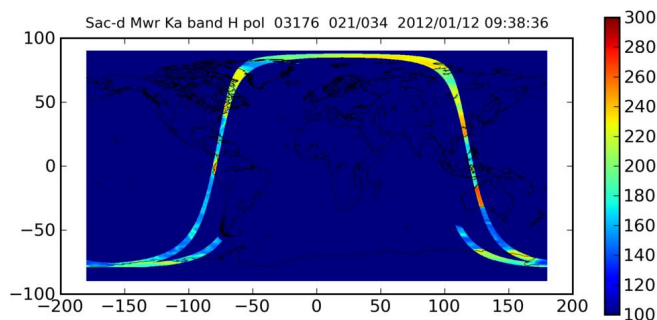
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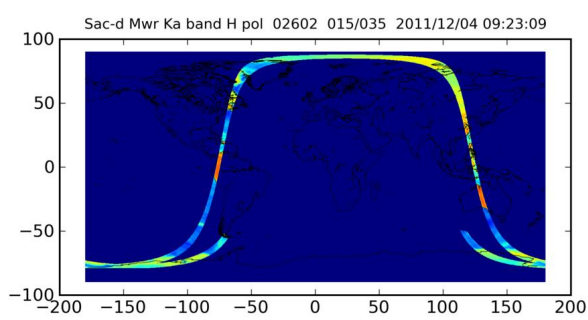
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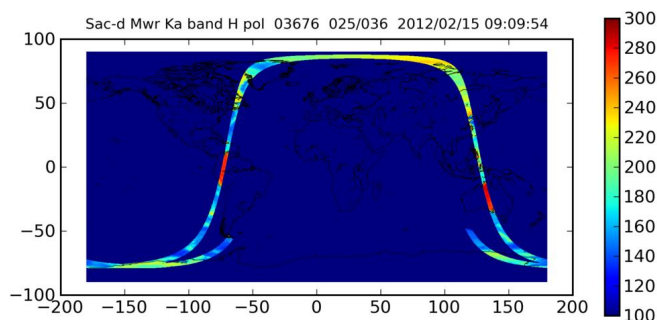
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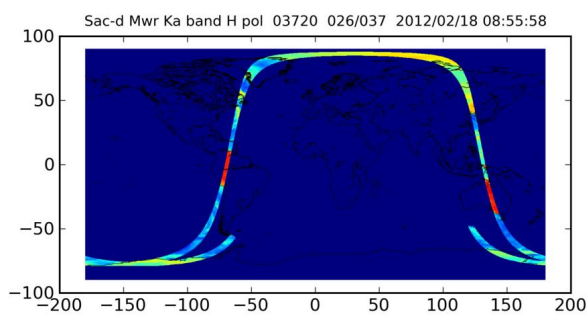
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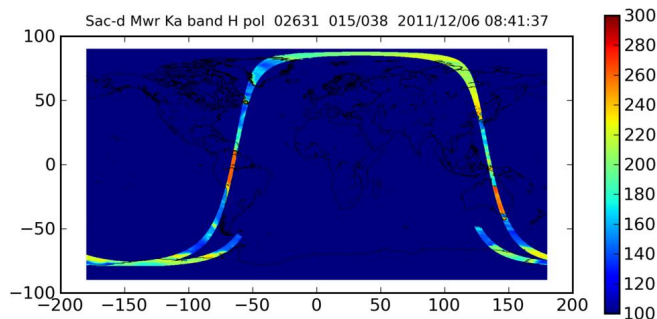
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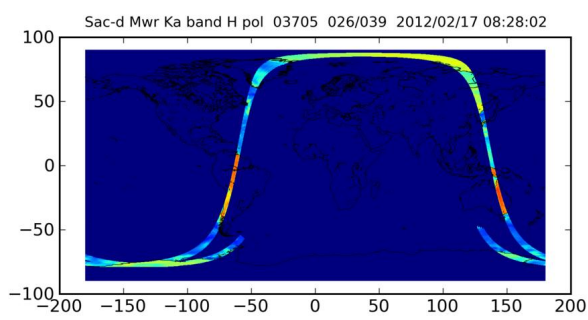
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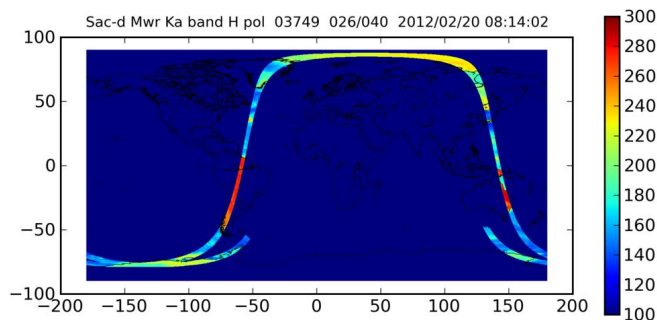
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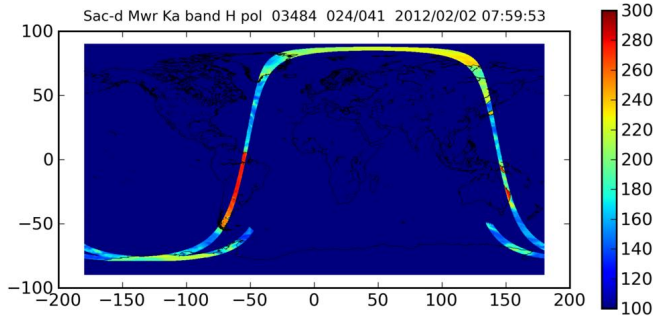
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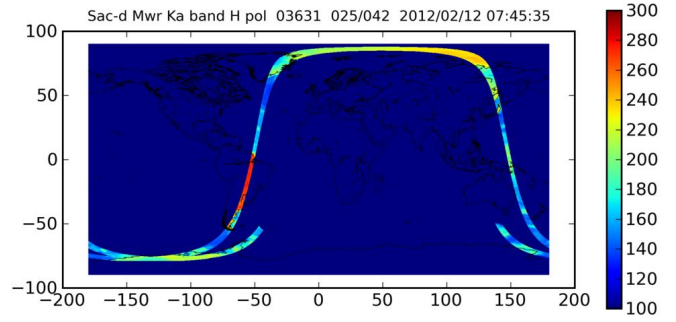
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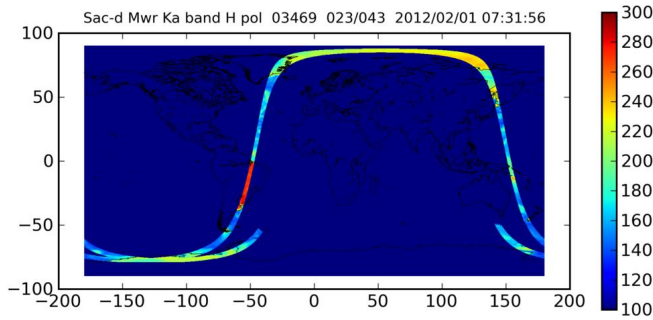
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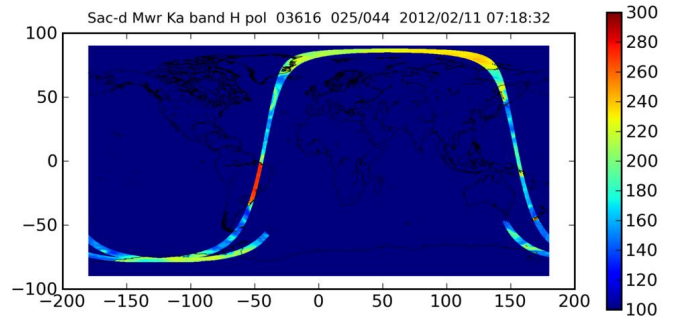
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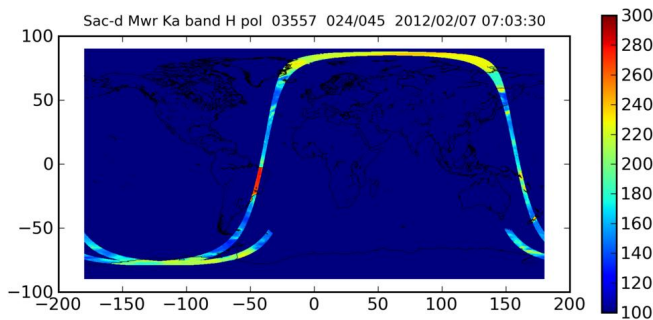
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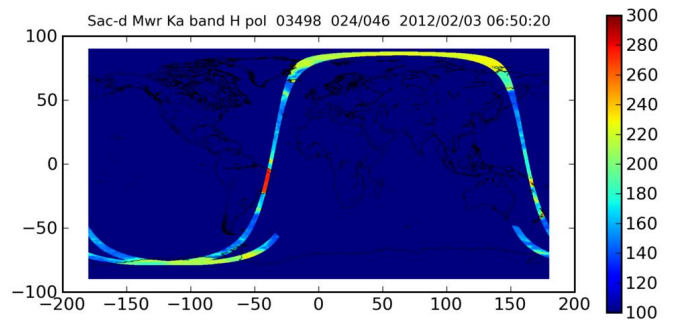
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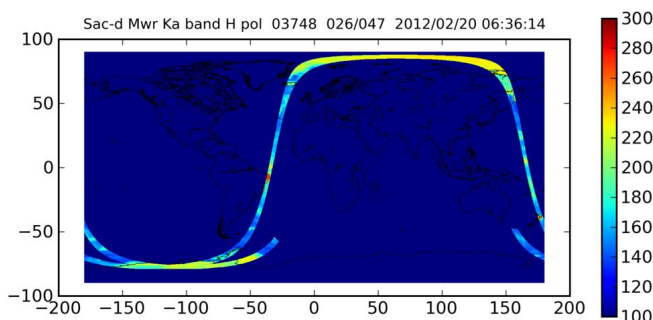
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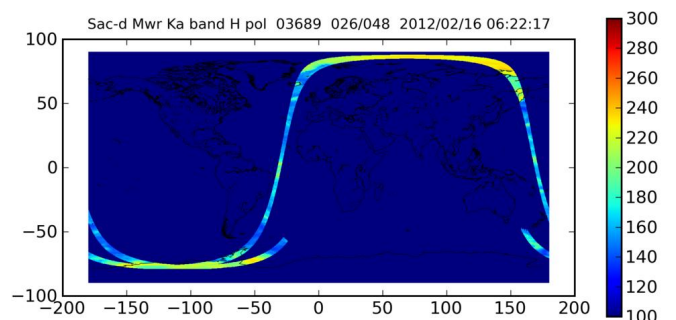
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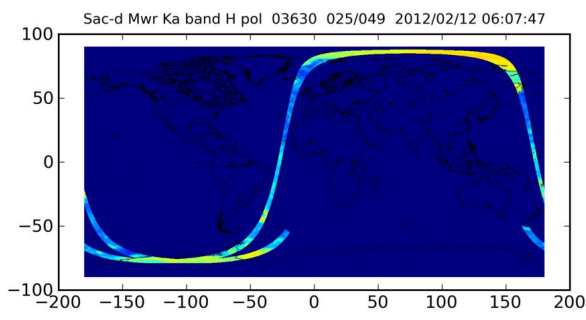
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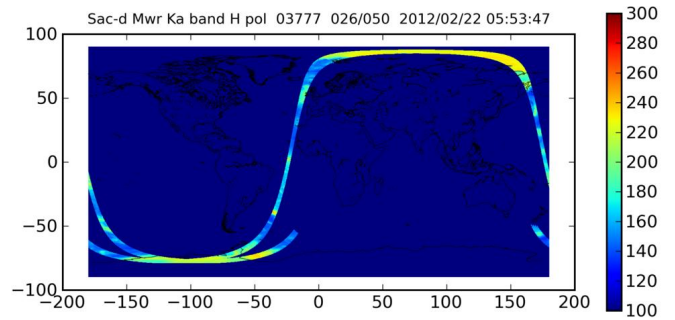
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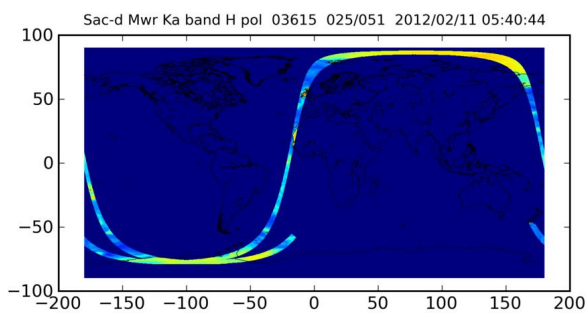
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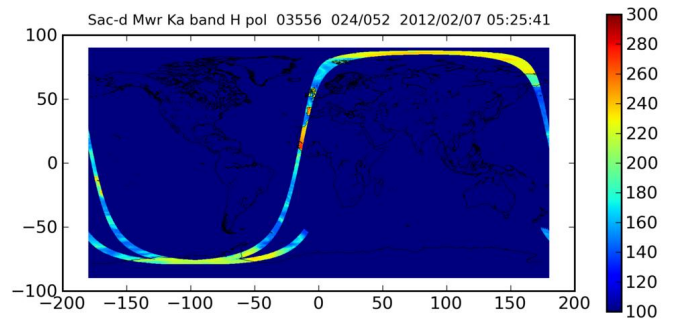
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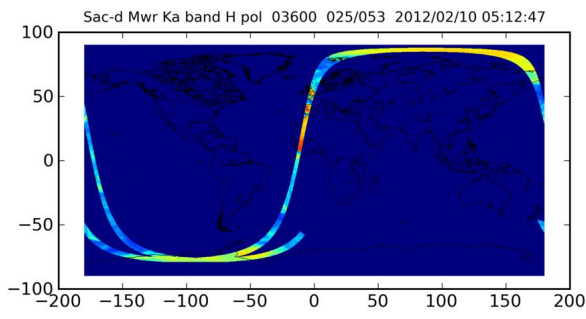
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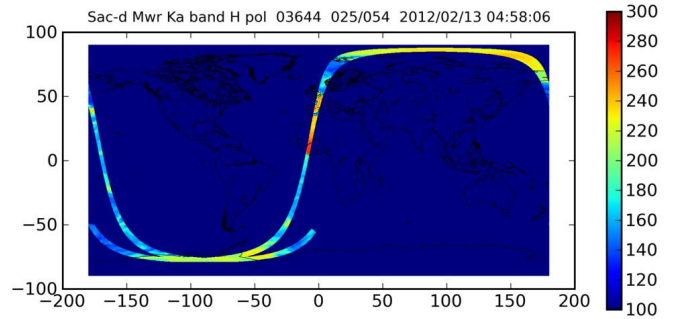
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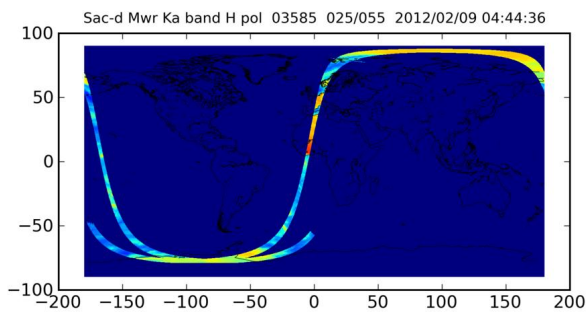
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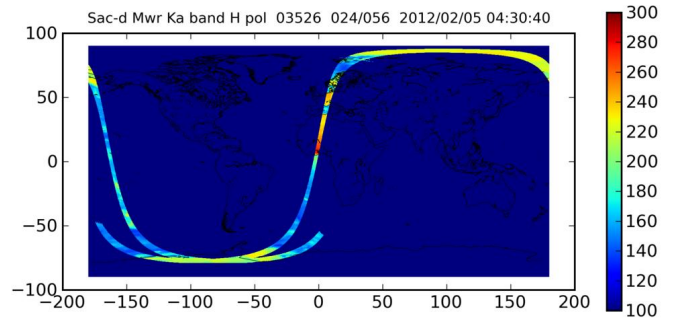
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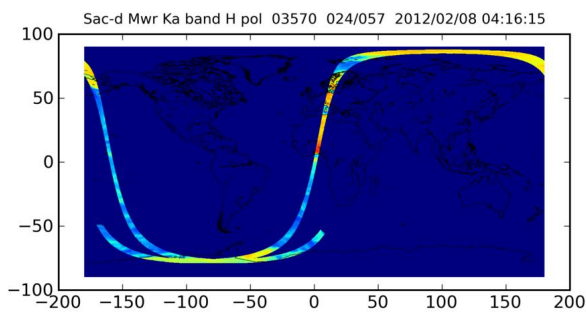
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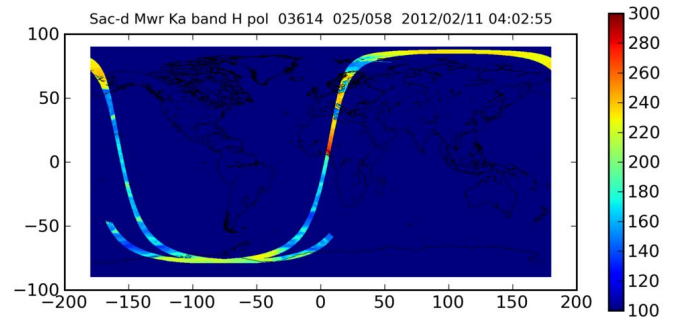
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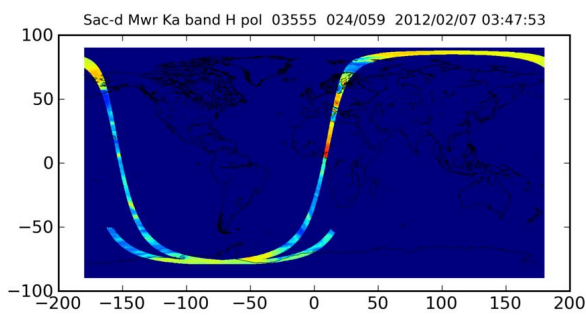
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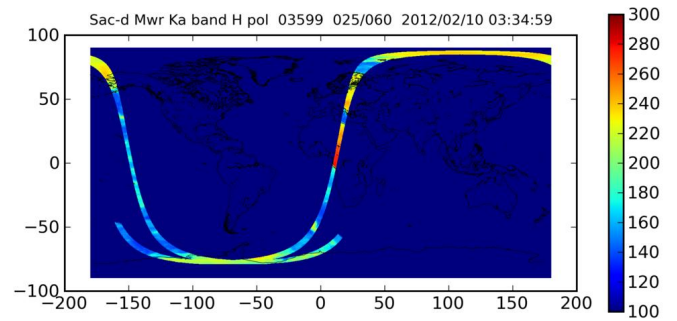
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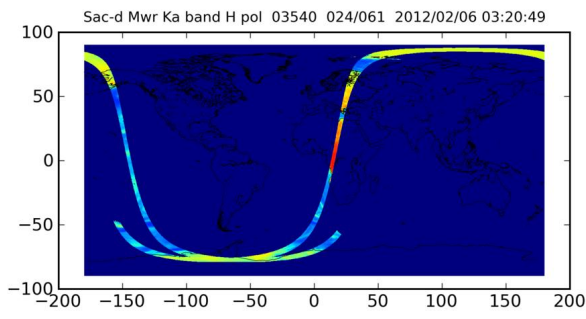
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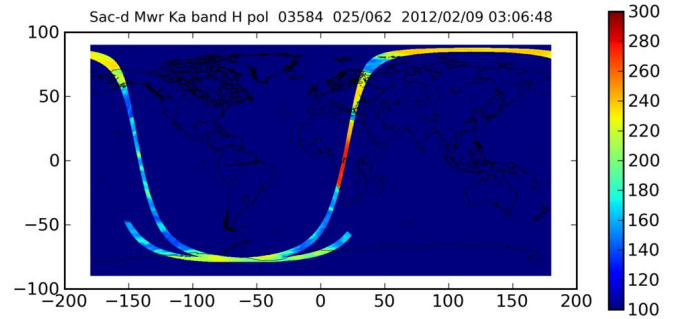
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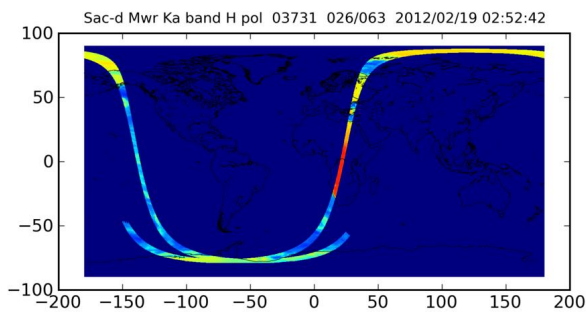
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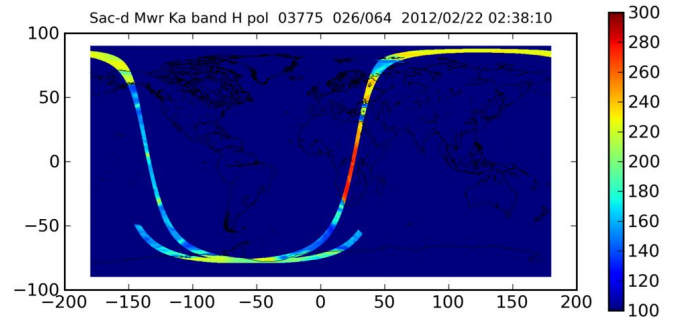
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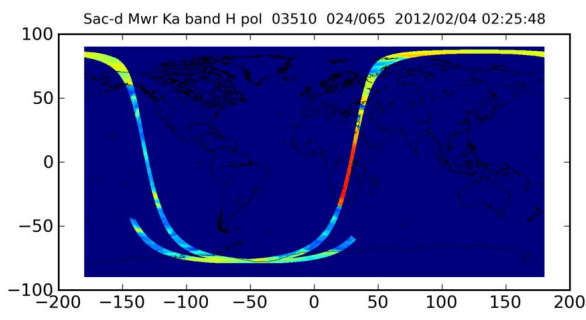
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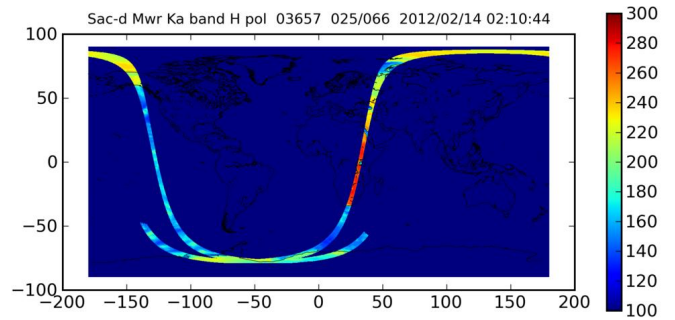
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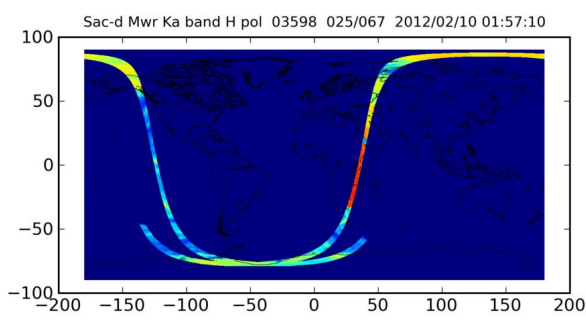
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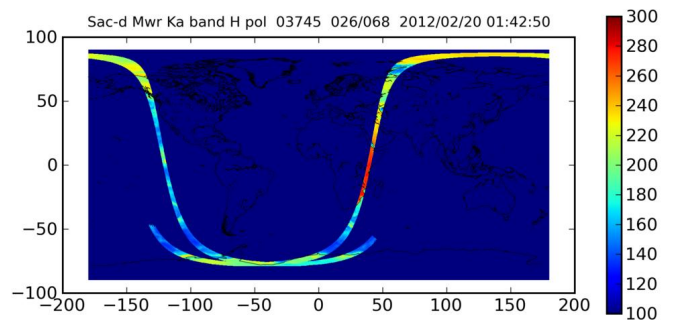
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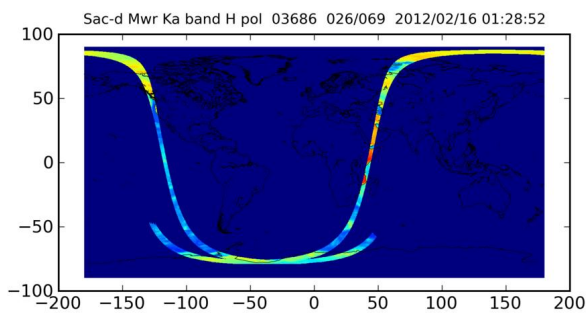
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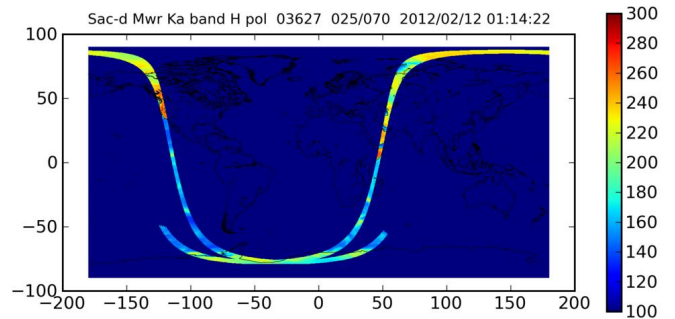
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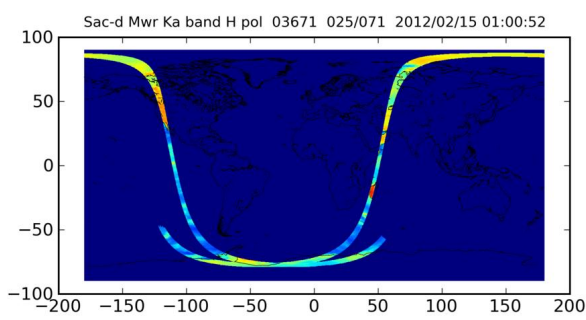
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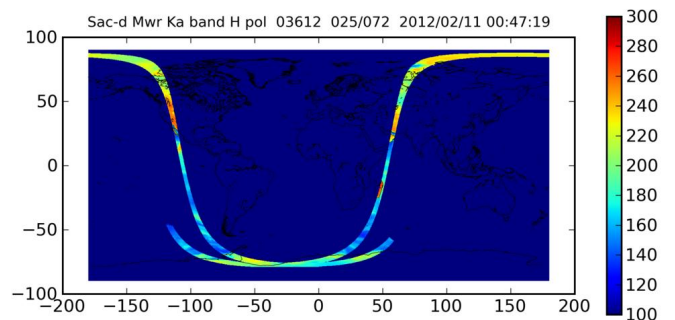
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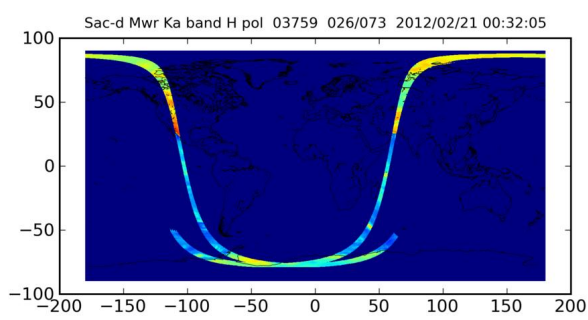
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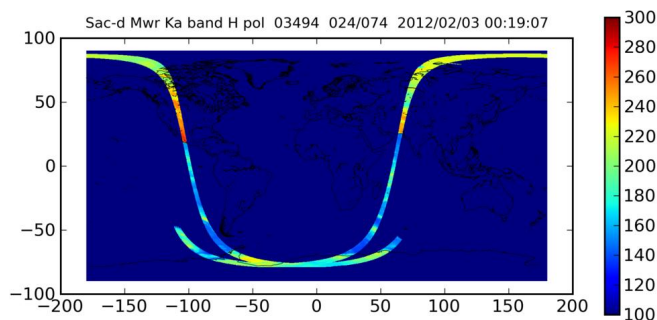
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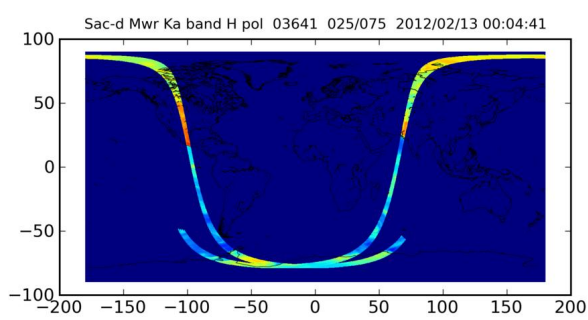
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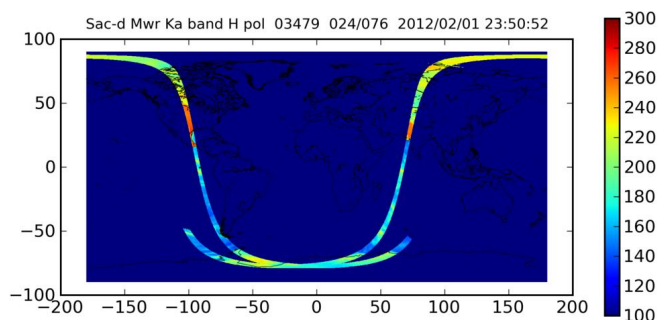
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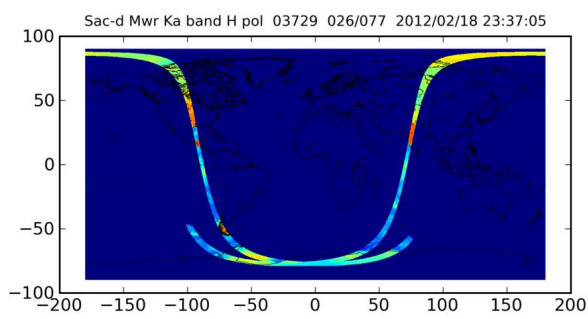
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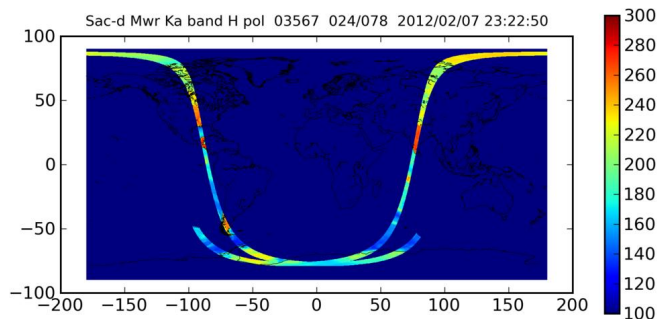
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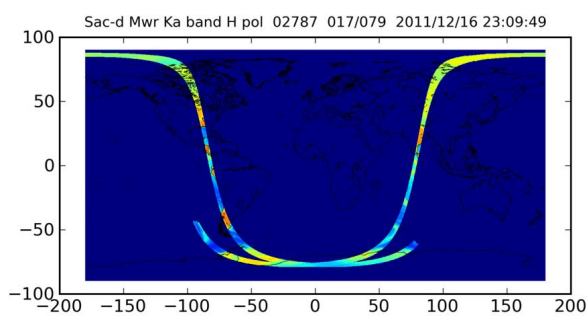
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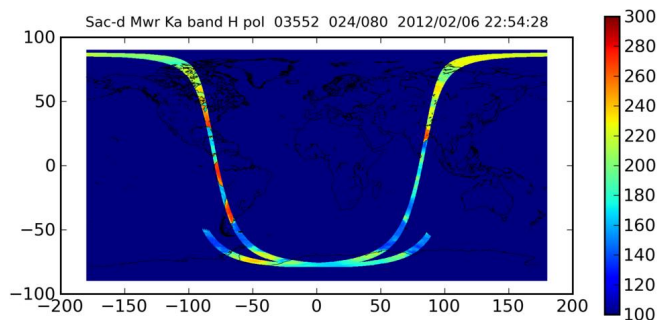
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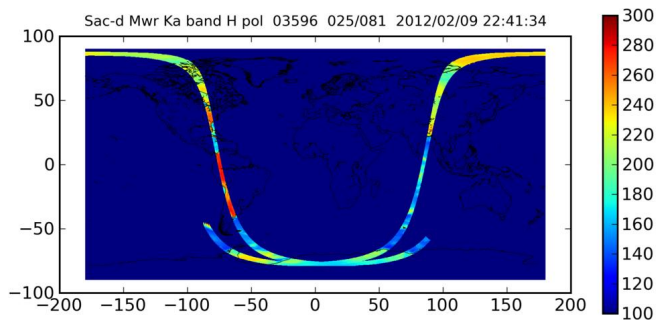
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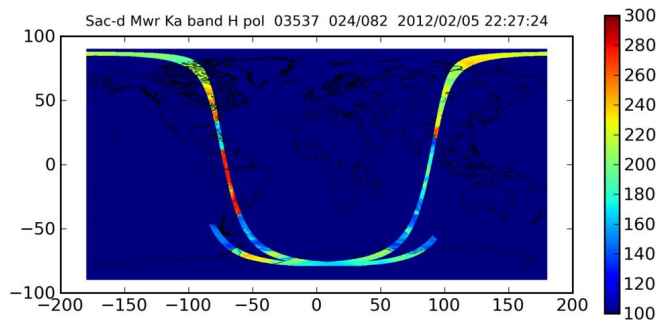
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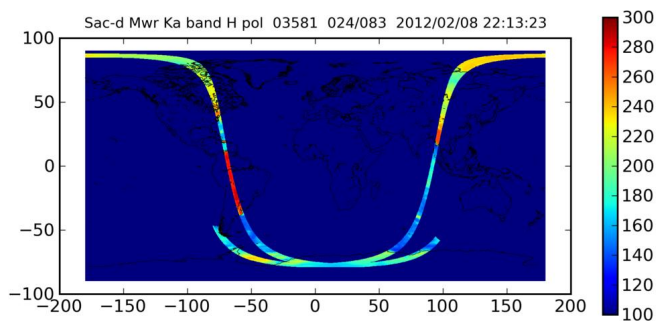
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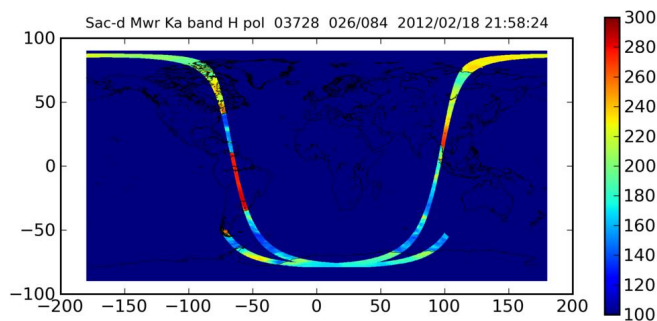
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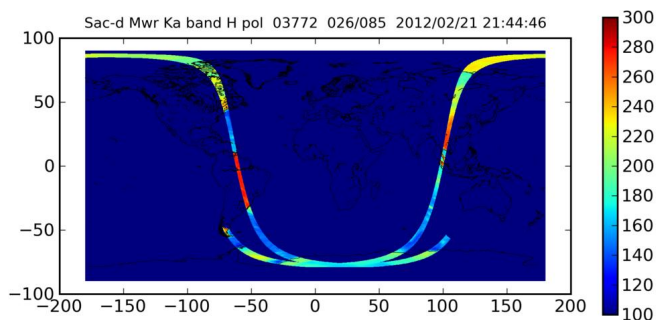
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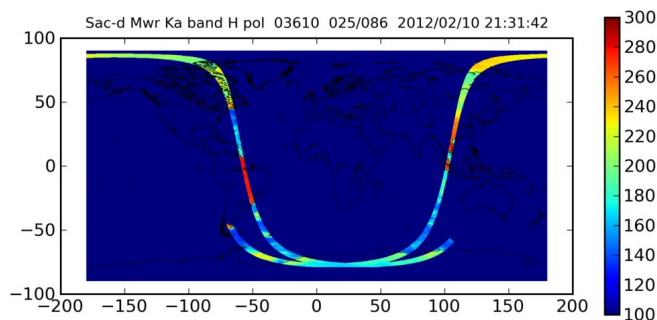
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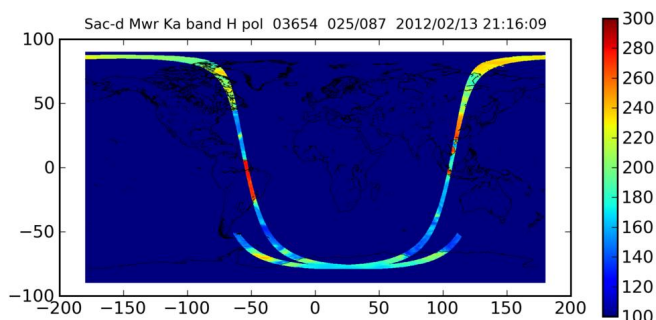
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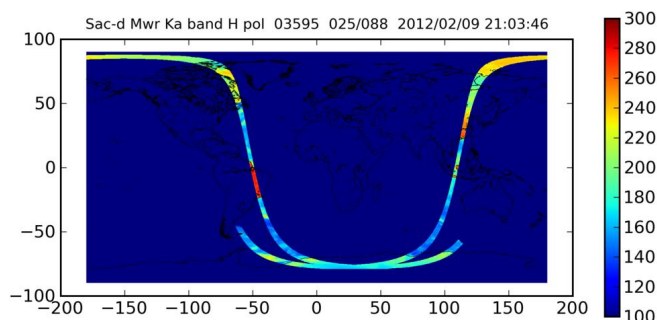
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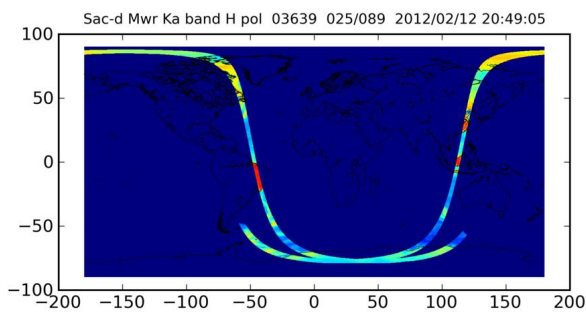
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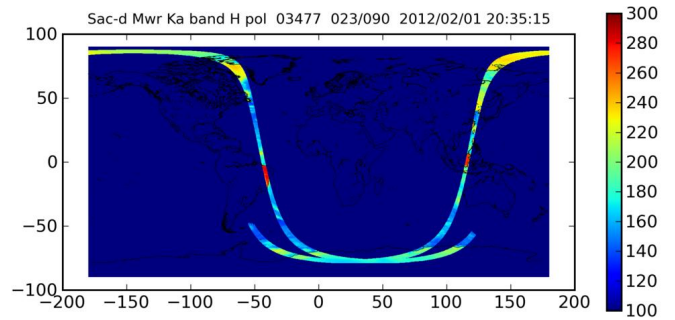
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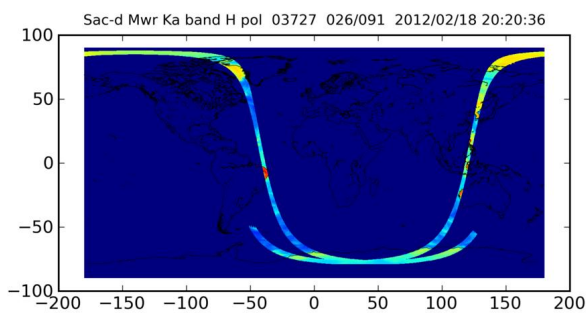
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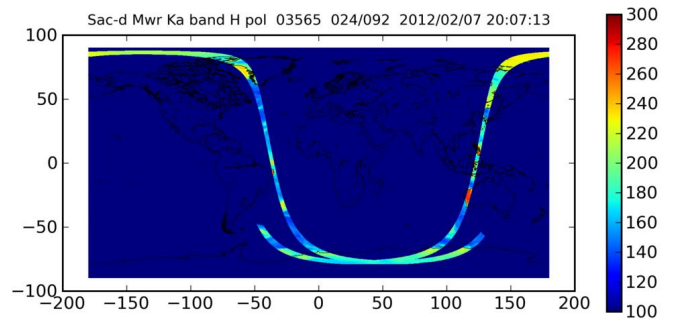
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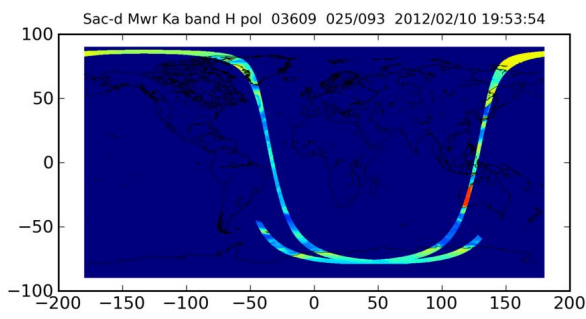
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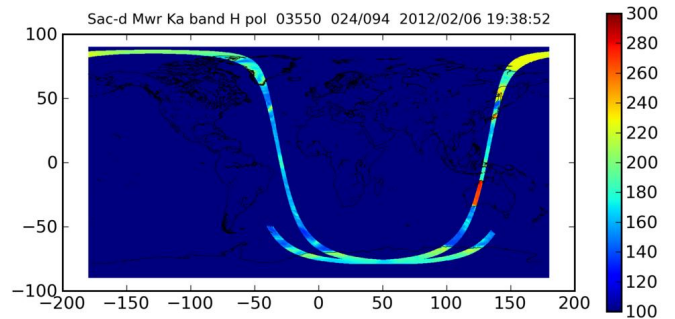
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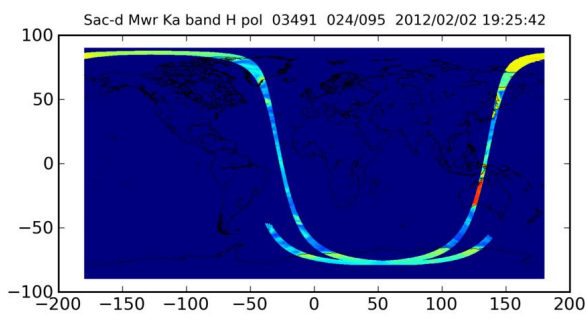
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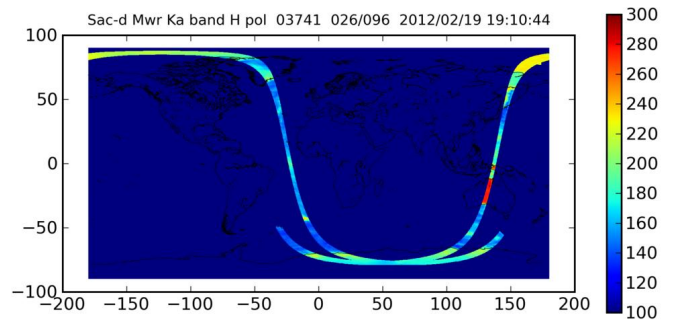
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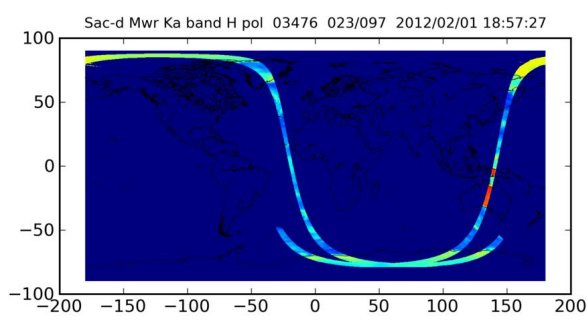
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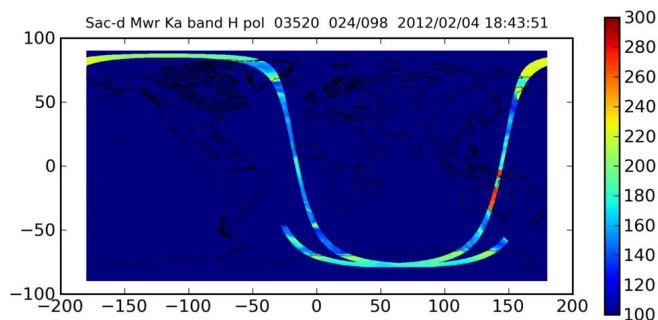
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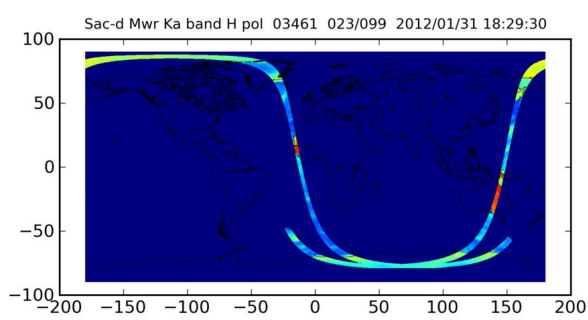
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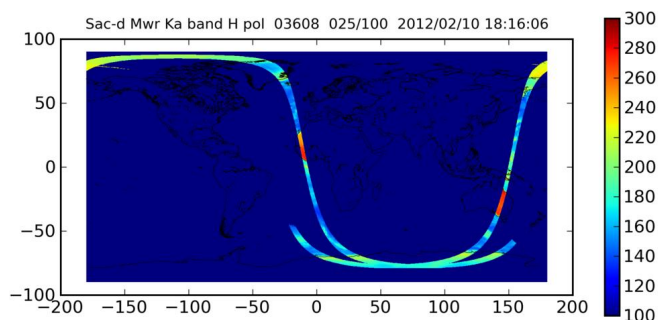
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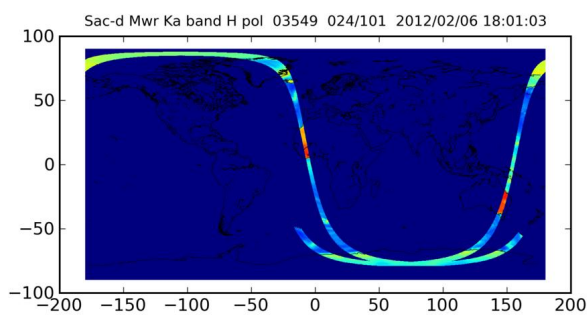
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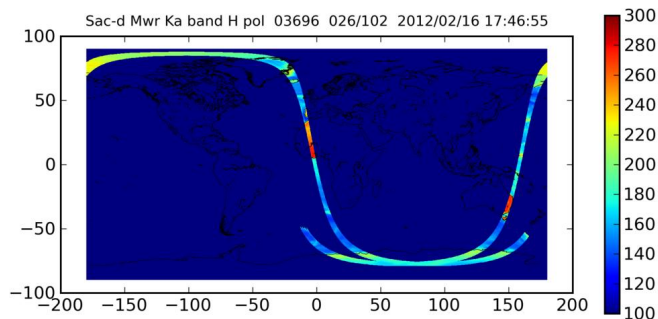
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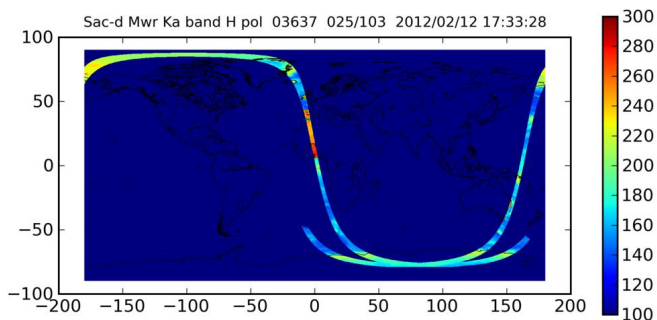
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Orbit 101



Orbit 102



Orbit 103

## 5 Abbreviations

<b>Acr./Abr.</b>	<b>Description</b>
CONAE	Comisión Nacional de Actividades Espaciales
NASA	National Aeronautics and Space Administration
ASI	Agenzia Spaziale Italian
CNES	Centre National d'Etudes Spatiales
CSA	Canadian Space Agency
SSS	Sea Surface Salinity
MWR	Microwave Radiometer
CUSS	CONAE User Segment Services
CFRSL	Central Florida Remote Sensing Laboratory
SST	Sea Surface Temperature
GDAS	Global Data Assimilation System
WS	Wind Speed
L2	Level 2
EDR	Enviromental Data Record
GMC	Geophysical Measurement Cell
GFS	Global Forecast System
SMN	Servicio Meteorológico Nacional
EIA	Earth Incidence Angle
Tb	Brightness Temperature

## 6 References

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