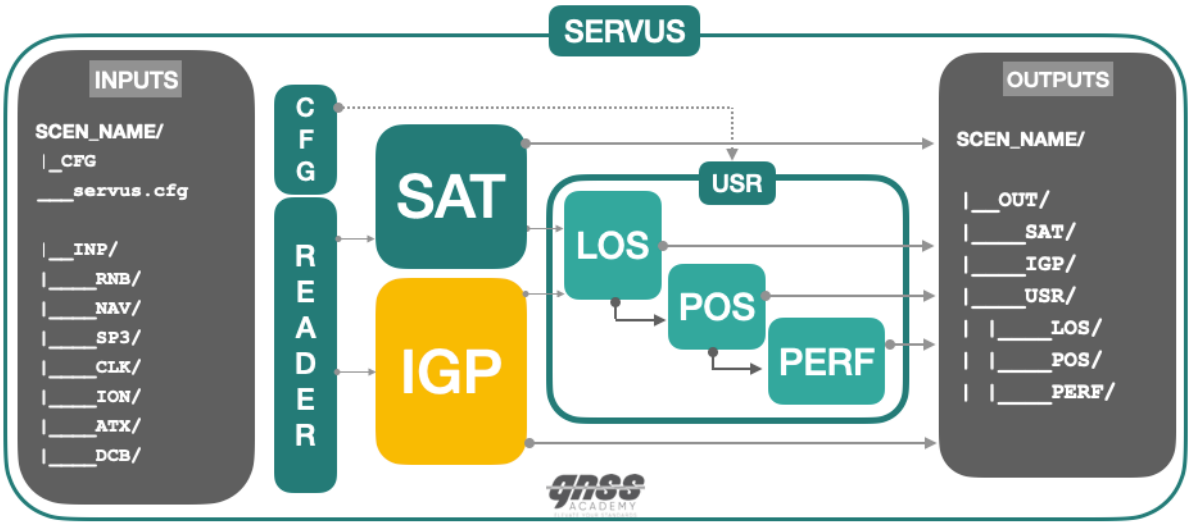
PROJECT: SERVUS		WP Number: WP-0000001
WP TITLE: WP2: IGP Performance Characterization		**Issue**: 1.0
START: W11	**END: W14**	
LEAD CONTRACTOR	GNSS Academy	
CUSTOMER	ESA	**WP LEADER**: Student
ESTIMATED EFFORT	15 hours	

OBJECTIVE

The main goal of this Work-Package is to develop the IGP Performance Module of SERVUS tool by providing the daily Ionospheric performance characterization on an EGNOS SIS real data campaign in January 2019

SCOPE

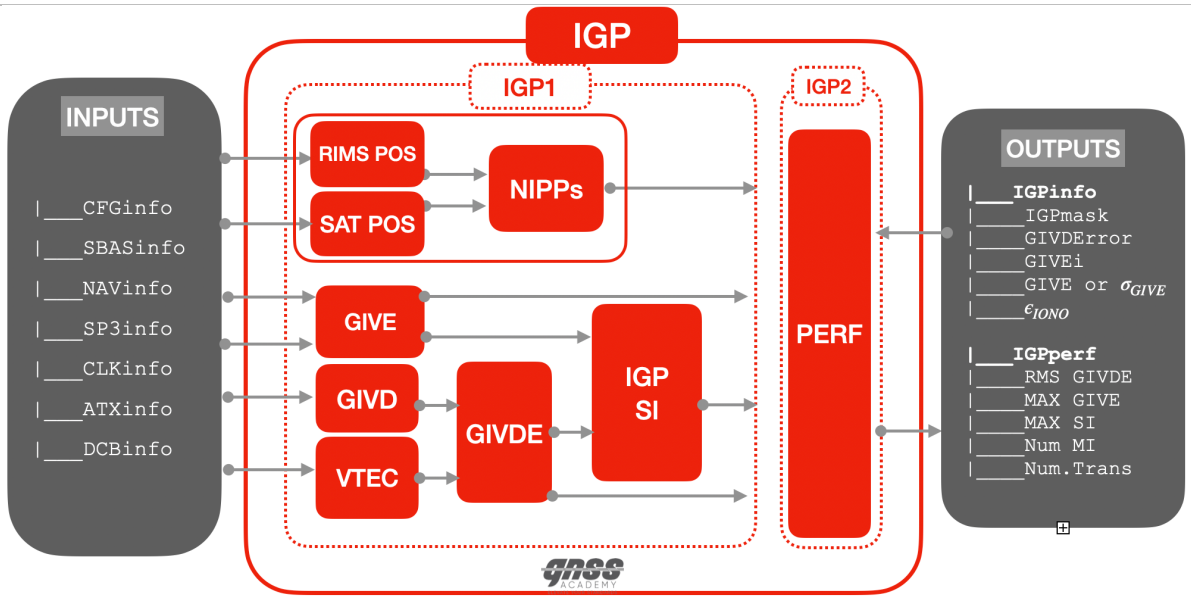
SERVUS high-level Architecture:



IGP Module extracts and formats the IGP corrections information, the GIVD and GIVE and applies the Ionospheric degradation factors. This module applies only to SF mode.

- Extract SBAS SIS IGP-related information:
  - IGP GIVD (Iono Delays)
  - IGP GIVE (Iono Delay Error Sigmas)
  - IGM Monitoring flats
  - Degradation Factors MT10.
- Compute True VTEC from reference files (IONEX)
- Compute IGP level main indicators:
  - GIVDE: Error in the GIVD
  - IGP Safety Index: SI=GIVDE/5.33*GIVE

Assess the IGP Performance in terms of accuracy (RMS GIVDE), Integrity (SI) and upper-bound (GIVE)

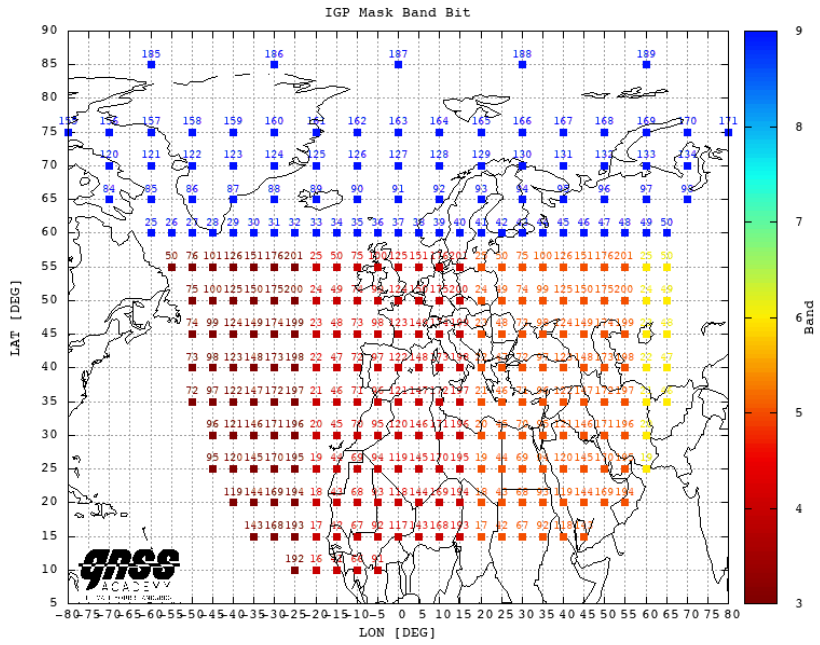


This Second Work-package deals with the Iono-level characterization performances in terms of accuracy, integrity, monitorability and upper-bound.

The characterization of the ionospheric performances will be done at IGP level.

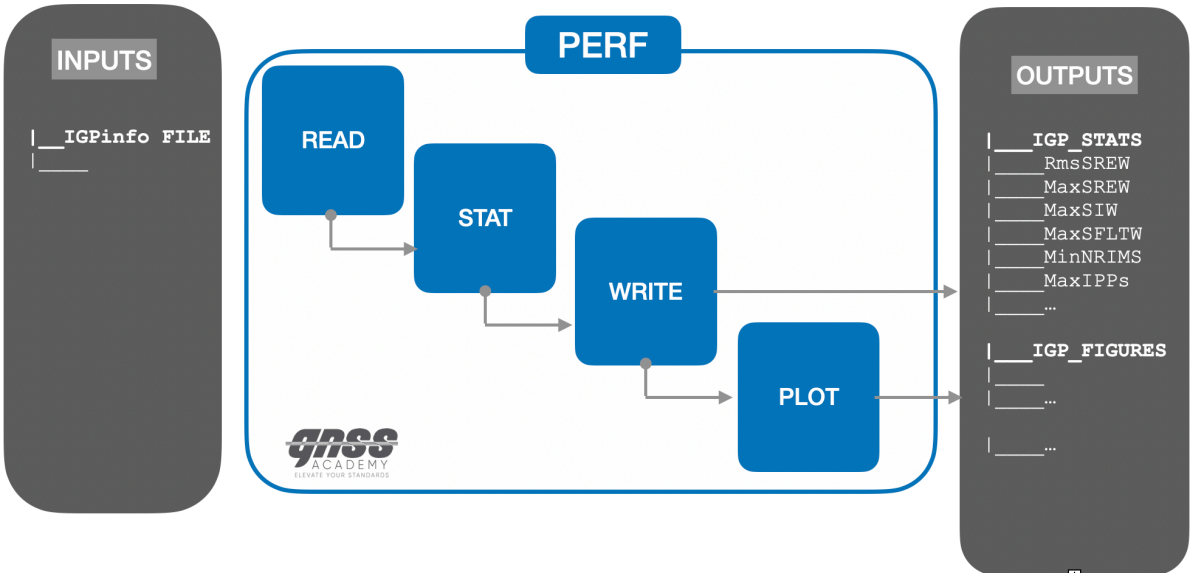
- **Ionosphere Accuracy** is given by different statistics of the ionospheric delay error (GIVDE).
- **Ionosphere Upper-bound** and **Continuity** characterization is given by statistics ionospheric delay error sigma (GIVE)
- **Ionosphere Integrity** is given by the safety index (SI) as the ration (SI=GIVDE/5.33GIVE)

Here is the EGNOS IGP mask composed of 287 IGPs. (Band and Bit in Band). Color bar represents the 5 Bands: 3,4,5,6 and 9. Bit Id. is represented in the map



This Work-package aims at developing the IGP2 Module corresponding to IGP PERF.

1. Read IGP Information file
2. Compute IGP Statistics
3. Write an IGP Statistics file
4. Plot Satellite Statistics
5. Plot time evolution of some IGPs.



INPUTS

This Work-package uses daily input files as the output of the SAT module.

1. **`IGP_INFO_Y19D014_G123.dat`** (See Description Below)

FILENAME: IGP_INFO_Y19D014_G123.dat)

Column	Content	Format	Units	Description
C1	SOD	%05d	SEC	Second of Day
C2	DOY	%03d	No Units	Day of the Year
C3	IGP ID	%d	No Units	IGP ID
C4	IGP BAND	%d	No Units	IGP Band
C5	IGP BIT	%d	No Units	IGP Bit in Band
C6	IGP LON	%f	DEG	IGP Longitude
C7	IGP LAT	%f	DEG	IGP Latitude
C8	STATUS	%d	No Units	IGP Monitoring Status (0:NM; 1:M; -1;DU)
C9	GIVEI	%f	No Units	Grid Ionospheric Vertical Error Sigma Index
C10	GIVE	%f	METER	Grid Ionospheric Vertical Error Sigma
C11	GIVD	%f	METER	Grid Ionospheric Vertical Delay
C12	GIVDE STATUS	%d	No Units	Computation Status of the GIVDE Error.
C13	GIVDE	%f	METER	Grid Ionospheric Vertical Delay Error
C14	SI	%f	No Units	IGP Safety Index (GIVDE/5.33*GIVE)
C15	VTEC	%f	METER	IGP VTEC from IONEX reference files
C16	NIPP	%f	No Units	Number of IPPs surrounding the IGP for a given spherical angle (e.g: 8 Deg)

C17	MMFLAG	%d	No Units	GIVE Status from MacroModel
C18	IONMMRATIO	%f	No Units	Ratio between GIVE and GIVE from MacroModel.

OUTPUTS

Two main kind of outputs for this Work Package are required:

- A Daily file with per satellite performance Statistics with the following format and content **IGP_STAT_Y19D014_G123.dat**

FILENAME: IGP_STAT_Y19D014_GEO123.dat)

Column	Content	Format	Units	Description
C1	IGP ID	%d	No Units	IGP ID
C2	IGP BAND	%d	No Units	IGP Band
C3	IGP BIT	%d	No Units	IGP Bit in Band
C4	IGP LON	%f	DEGREES	IGP Longitude
C5	IGP LAT	%f	DEGREES	IGP Latitude
C6	MON	%f	No Units	IGP Monitoring Percentage during the day
C7	MIN-IPP	%d	No Units	Minimum Number of IPPs surrounding the IGP
C8	MAX-IPP	%d	No Units	Maximum Number of IPPs surrounding the IGP
C9	NTRANS	%d	No Units	Number of Transitions from M to NM and M to DU
C10	RMSGIVDE	%f	METER	RMS of GIVD Error
C11	MAXGIVD	%f	METER	Maximum GIVD
C12	MAXGIVE	%f	METER	Maximum GIVE
C13	MAXGIVEi	%f	No Units	Maximum GIVE Indicator
C14	MAXVTEC	%f	METER	Maximum VTEC
C15	MAXSI	%f	No Units	Maximum Safety Index (SI=GIVD/kf*GIVE)
C16	NMI	%d	No Units	Number of MIs on IGP

TASKS

ID	DESCRIPTION
T0. PRELIMINARY	Downloading and Understanding
T0.1 Input files	Download and place IGP Information files. Download following TAR file: **STEP1. Download SERVUS-TOOL folder tree and files** → **SERVUS_WP2_IGP.tgz** **STEP2. Place it here** → **cd SBPT/SERVUS/SERVUS_V1.0/** **STEP3 untar the file.** ***tar xvfz*** **SERVUS_WP2_IGP.tgz** Check that all the following information is available: **SERVUS_WP2_IGP** **|____SRC** | |____IgpPerformances.py

	│ │____IgpFunctions.py │ │____COMMON │ │ │____GnssConstants.py │ │ │____Dates.py **│____SCN** │ │____EGNOS-SIS-GEO123-JAN19 **│ │ │____CFG** │ │ │ │____igpperformances.cfg **│ │ │____INP** **│ │ │ │____NAV**/brdc0140.19n) **│ │ │ │____RNB**/M1230140.19b **│ │ │ │____EMS**/GEO123/2019/DOY014/h*.ems **│ │ │ │____SP3**/igs20361.sp3 **│ │ │ │____DCB**/P1C11901.DCB & P1P21901.DCB **│ │ │ │____ATX**/igs14.atx **│ │ │ │____ION**/igsg0140.19i **│ │ │ │____CLK**/igs20361.clk & igs20361.clk_30s **│ │ │____OUT** **│ │ │ │____IGP** │ │ │ │ │____IGP_INFO_Y19D014_G123_50s.dat │ │ │ │ │____IGP_INFO_Y19D015_G123_50s.dat │ │ │ │ │____IGP_INFO_Y19D016_G123_50s.dat │ │ │ │ │____figures Note that there are 3 SAT_INFO files already sampled at 50 seconds in order to Speed-up the execution process. Output Files will be generated in: **OUT/IGP/IGP_STAT_Y19D014_G123.dat** **OUT/IGP/IGP_STAT_Y19D015_G123.dat** **OUT/IGP/IGP_STAT_Y19D016_G123.dat** Output Figures will be generated in: **OUT/IGP/figures/*.png**	
T1. IMPLEMENTATION	Functions Implementation: Open/Reading/Loading	
T1.1 Configuration	Check configuration file. 2 configuration parameters, INI_DATE and END_DATE. In order to run only one day, both shall be the same **CFG/igpperformances.cfg**	
T1.2 Coding	Implement the necessary Python functions to read IGP_INFO file, compute, write and plot the IGP Statistics. Note that this is an equivalent module as for Satellite Performances, but now for IGP performances. Most of the functions and routines are the same. Please inspire from SAT PERF module.	
T2. STATISTICS	Create a file including all IGP Statistics with the following information per columns. IGP_STATISTICS_	
IGP ID	IGP number between [1 – Number of IGPs]	
IGP Band	IGP Band Number between 0-10	
IGP bit	IGP Bit Number	

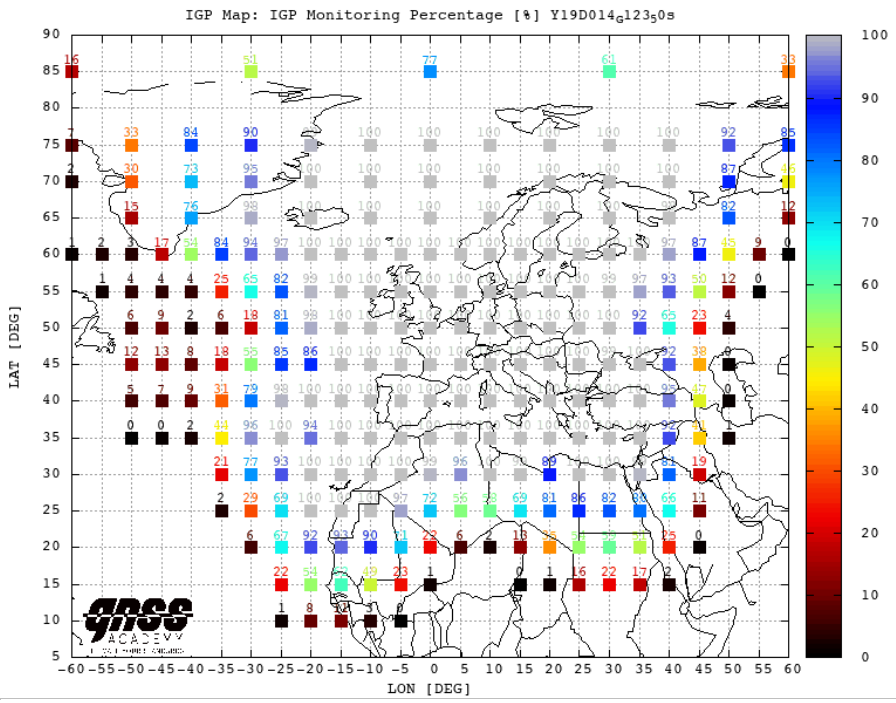
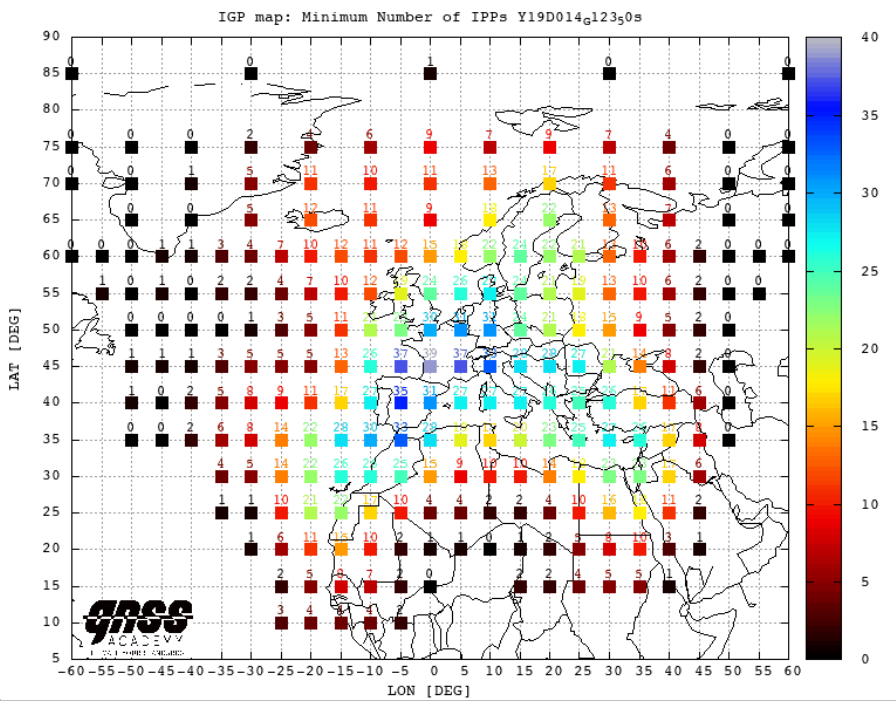
IGP Lon	IGP Longitude [deg]
IGP Lat	IGP Latitude [deg]
MON	IGP Monitoring Percentage in the day. Count the number of epochs the IGP has been monitored during the day divided by the total number of seconds in the day.
MIN IPPs	Minimum number of IPPs surrounding the IGP. IPP is the Ionospheric Pierce Point between the RIMS and Satellites. An IGP will be monitored by EGNOS when a minimum number of IPPs surrounding the IGP at a given spherical distance.
MAX IPPS	Maximum number of IPPs surrounding the IGP
NTRANS	IGP Number of Transitions from M: Monitored to NM: Not Monitored or DU:DON'T USE Count the number of times each IGP goes from Monitored to Not Monitored or to Don't Use Status
RMS-GIVDE	Root Mean Square of the GIVD error (GIVDE) in meters
MAX GIVD	Maximum value of the GIVD in meters
MAX-GIVE	Maximum value of the GIVE [m]
MAX-GIVEI	Maximum value of the GIVE Indicator
MAX-VTEC	Maximum value of the VTEC as the true GIVD.
MAX-SI	Maximum value of the Safety Index (SI_{IGP}) as the ratio between GIVDE/5.33GIVE
NMI	Number of MI (Misleading Information or integrity events) as the number of times the SI>1

IGP_STAT_Y19D014_G123_50s.dat

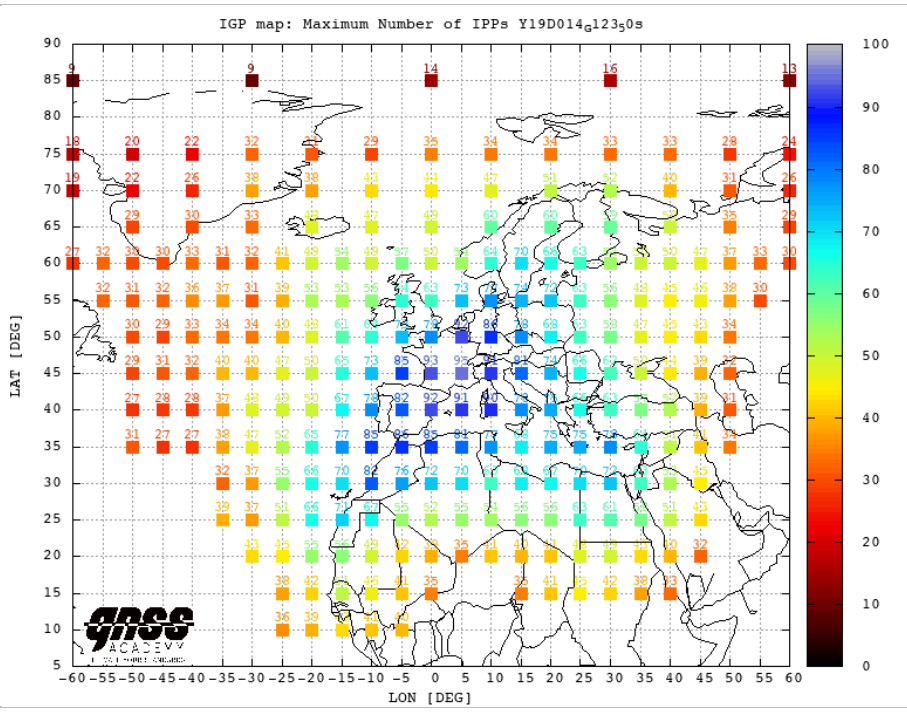
# ID	BAND	BIT	LON	LAT	MON	MINIPPs	MAXIPPs	NTRANS	RMSGIVDE	MAXGIVD	MAXGIVE	MAXGIVEI	MAXVTEC	MAXSI	NMI
1	3	50	-55.000	55.000	1.56	1	32	4	0.2234	1.0000	13.6780	14	1.2072	0.0185	0
2	3	72	-50.000	35.000	0.46	0	31	2	0.3095	1.1250	13.6780	14	1.9569	0.0158	0
3	3	73	-50.000	40.000	5.91	1	27	5	0.4754	1.3750	13.6780	14	1.8514	0.0225	0
4	3	74	-50.000	45.000	12.75	1	29	4	0.2316	1.5000	13.6780	14	1.6565	0.0203	0
5	3	75	-50.000	50.000	6.55	0	30	3	0.1924	1.2500	13.6780	14	1.4075	0.0171	0
6	3	76	-50.000	55.000	4.17	0	31	5	0.2135	0.8750	13.6780	14	1.1936	0.0162	0
9	3	97	-45.000	35.000	0.70	0	27	2	0.1130	1.3750	13.6780	14	1.8788	0.0130	0
10	3	98	-45.000	40.000	7.47	0	28	6	0.3214	1.2500	13.6780	14	1.7899	0.0206	0
11	3	99	-45.000	45.000	13.04	1	31	7	0.2432	1.2500	13.6780	14	1.6727	0.0181	0
12	3	100	-45.000	50.000	9.56	0	29	7	0.2116	1.1250	13.6780	14	1.4291	0.0160	0
13	3	101	-45.000	55.000	4.11	1	32	6	0.3304	1.5000	13.6780	14	1.1801	0.0479	0
17	3	122	-40.000	35.000	2.03	2	27	4	0.1650	1.5000	13.6780	14	1.8595	0.0157	0
18	3	123	-40.000	40.000	9.10	2	28	10	0.3436	1.1250	13.6780	14	1.7377	0.0543	0
19	3	124	-40.000	45.000	8.17	1	32	9	0.4225	1.1250	13.6780	14	1.6406	0.0210	0
20	3	125	-40.000	50.000	2.95	0	33	5	0.3519	1.3750	13.6780	14	1.4454	0.0208	0
21	3	126	-40.000	55.000	4.52	0	36	9	0.3177	1.7500	13.6780	14	1.1693	0.0203	0
24	3	145	-35.000	25.000	2.72	1	39	5	0.2606	3.0000	13.6780	14	2.7043	0.0461	0
25	3	146	-35.000	30.000	21.61	4	32	16	0.2412	2.2500	13.6780	14	2.2316	0.0461	0
26	3	147	-35.000	35.000	44.38	6	38	28	0.1734	1.8750	13.6780	14	1.8784	0.2650	0
27	3	148	-35.000	40.000	31.69	5	37	25	0.3036	1.6250	4.5590	13	1.6899	0.2676	0
28	3	149	-35.000	45.000	18.31	3	40	33	0.4675	1.6250	13.6780	14	1.6105	0.1446	0
29	3	150	-35.000	50.000	6.66	0	34	11	0.2779	1.5000	13.6780	14	1.4264	0.0447	0
30	3	151	-35.000	55.000	25.38	2	37	16	0.5245	2.8750	13.6780	14	1.1585	0.0543	0
32	3	169	-30.000	20.000	6.14	1	43	8	0.1258	3.7500	13.6780	14	3.4429	0.0177	0
33	3	170	-30.000	25.000	29.95	1	37	17	0.1943	3.3750	13.6780	14	2.9286	0.0988	0
34	3	171	-30.000	30.000	77.35	5	37	17	0.3128	2.1250	13.6780	14	2.3548	0.2681	0
35	3	172	-30.000	35.000	96.81	8	47	4	0.2132	1.7500	4.5590	13	1.9001	0.3138	0
36	3	173	-30.000	40.000	79.43	8	48	17	0.3043	1.6250	13.6780	14	1.6835	0.3494	0
37	3	174	-30.000	45.000	55.68	5	40	29	0.3490	1.5000	13.6780	14	1.5807	0.2738	0
38	3	175	-30.000	50.000	18.37	1	34	15	0.4900	2.1250	13.6780	14	1.4372	0.1511	0
39	3	176	-30.000	55.000	65.93	2	31	25	0.5079	2.8750	13.6780	14	1.1801	0.1737	0
40	3	192	-25.000	10.000	1.85	3	36	3	0.2622	3.0000	13.6780	14	3.5241	0.0165	0
41	3	193	-25.000	15.000	22.48	2	38	19	0.2437	3.8750	13.6780	14	3.7677	0.2193	0
42	3	194	-25.000	20.000	67.21	6	45	18	0.3128	4.2500	13.6780	14	3.6702	0.2132	0
43	3	195	-25.000	25.000	69.81	10	51	15	0.2200	3.5000	4.5590	13	3.1533	0.2790	0
44	3	196	-25.000	30.000	93.05	14	55	6	0.3816	2.1250	1.3680	11	2.4847	0.4299	0
45	3	197	-25.000	35.000	100.00	14	52	0	0.3651	1.6250	1.3680	11	1.9217	0.3785	0
46	3	198	-25.000	40.000	98.84	9	49	1	0.3567	1.5000	4.5590	13	1.6781	0.3930	0
47	3	199	-25.000	45.000	85.17	5	47	15	0.3147	1.7500	13.6780	14	1.5509	0.3412	0
48	3	200	-25.000	50.000	81.40	3	40	25	0.2807	1.7500	13.6780	14	1.4616	0.2200	0
49	3	201	-25.000	55.000	82.56	4	39	15	0.4199	2.3750	13.6780	14	1.2018	0.2756	0
50	4	16	-20.000	10.000	8.92	4	39	11	0.2798	3.2500	13.6780	14	3.4754	0.0446	0
51	4	17	-20.000	15.000	54.63	5	42	21	0.2218	3.7500	13.6780	14	3.8002	0.2504	0
52	4	18	-20.000	20.000	92.12	11	55	5	0.2285	4.2500	4.5590	13	3.8651	0.2707	0
53	4	19	-20.000	25.000	100.00	21	66	0	0.2194	3.8750	1.8240	12	3.3779	0.3364	0
54	4	20	-20.000	30.000	100.00	22	66	0	0.3883	2.1250	1.8240	12	2.6146	0.3991	0
55	4	21	-20.000	35.000	94.96	22	65	2	0.4765	1.5000	0.8210	8	1.9452	0.4181	0
56	4	22	-20.000	40.000	100.00	11	50	0	0.4545	1.5000	1.0940	10	1.7080	0.4382	0
57	4	23	-20.000	45.000	86.56	5	50	14	0.3019	1.7500	4.5590	13	1.5213	0.3117	0
58	4	24	-20.000	50.000	98.20	5	48	6	0.2104	1.5000	13.6780	14	1.4455	0.2296	0
59	4	25	-20.000	55.000	99.13	7	53	3	0.2109	1.3750	4.5590	13	1.1909	0.2941	0

60	4	41	-15.000	10.000	11.01	4	43	16	0.3143	3.1250	13.6780	14	3.4111	0.0625	0
61	4	42	-15.000	15.000	62.34	8	51	18	0.2192	4.1250	13.6780	14	3.7839	0.2487	0
62	4	43	-15.000	20.000	93.92	15	56	4	0.2954	4.7500	4.5590	13	3.9626	0.3605	0
63	4	44	-15.000	25.000	100.00	22	71	0	0.3283	4.3750	1.8240	12	3.5890	0.4192	0
64	4	45	-15.000	30.000	100.00	26	70	0	0.3400	2.5000	1.3680	11	2.7446	0.3791	0
65	4	46	-15.000	35.000	100.00	28	77	0	0.4904	1.6250	0.8210	8	1.9763	0.4429	0
66	4	47	-15.000	40.000	100.00	17	67	0	0.5114	1.2500	0.9120	9	1.7593	0.4307	0
67	4	48	-15.000	45.000	100.00	13	65	0	0.3239	1.5000	1.8240	12	1.5320	0.3984	0
68	4	49	-15.000	50.000	100.00	11	61	0	0.1855	1.3750	1.8240	12	1.4318	0.3097	0
69	4	50	-15.000	55.000	100.00	10	53	0	0.1362	1.1250	1.3680	11	1.1801	0.2781	0
70	4	66	-10.000	10.000	3.48	4	41	6	0.2322	2.6250	13.6780	14	3.3536	0.0433	0
71	4	67	-10.000	15.000	49.42	7	46	21	0.3237	4.0000	13.6780	14	3.7027	0.2496	0
72	4	68	-10.000	20.000	90.03	10	49	6	0.5245	5.6250	13.6780	14	3.9463	0.5143	0
73	4	69	-10.000	25.000	100.00	17	67	0	0.4497	4.7500	4.5590	13	3.6378	0.4464	0
74	4	70	-10.000	30.000	100.00	26	82	0	0.3035	3.0000	1.3680	11	2.8420	0.3765	0
75	4	71	-10.000	35.000	100.00	30	85	0	0.4182	1.7500	0.9120	9	2.0354	0.4087	0
76	4	72	-10.000	40.000	100.00	27	78	0	0.4990	1.2500	0.9120	9	1.8108	0.3934	0
77	4	73	-10.000	45.000	100.00	26	73	0	0.3457	1.2500	1.0940	10	1.5536	0.3663	0
78	4	74	-10.000	50.000	100.00	21	64	0	0.1643	1.3750	1.0940	10	1.4184	0.2995	0
79	4	75	-10.000	55.000	100.00	12	56	0	0.1338	1.1250	1.3680	11	1.1700	0.2822	0
80	4	91	-5.000	10.000	0.46	2	40	1	0.9627	0.3750	13.6780	14	3.3026	0.0246	0
81	4	92	-5.000	15.000	23.41	2	41	16	0.5493	4.5000	13.6780	14	3.5863	0.0621	0
82	4	93	-5.000	20.000	71.90	2	42	24	0.8996	7.5000	13.6780	14	3.8164	0.2788	0
83	4	94	-5.000	25.000	97.74	10	55	6	0.5289	7.5000	13.6780	14	3.5403	0.4426	0
84	4	95	-5.000	30.000	100.00	25	76	0	0.3156	3.1250	1.8240	12	2.8095	0.4071	0
85	4	96	-5.000	35.000	100.00	33	86	0	0.3464	1.7500	0.8210	8	2.1116	0.3902	0
86	4	97	-5.000	40.000	100.00	35	82	0	0.4386	1.3750	0.9120	9	1.8622	0.3861	0
87	4	98	-5.000	45.000	100.00	37	85	0	0.3505	1.2500	0.9120	9	1.5753	0.3860	0
88	4	99	-5.000	50.000	100.00	23	73	0	0.1503	1.3750	1.0940	10	1.4109	0.2922	0
89	4	100	-5.000	55.000	100.00	19	64	0	0.1273	1.2500	1.0940	10	1.1612	0.2966	0
90	4	117	0.000	15.000	1.39	0	35	3	0.5466	2.2500	13.6780	14	3.4763	0.0268	0
91	4	118	0.000	20.000	22.83	1	39	20	0.5110	5.3750	13.6780	14	3.6791	0.1289	0
92	4	119	0.000	25.000	72.42	4	52	20	0.5051	5.5000	13.6780	14	3.4591	0.3274	0
93	4	120	0.000	30.000	99.30	15	72	2	0.2984	2.8750	13.6780	14	2.8258	0.3828	0
94	4	121	0.000	35.000	100.00	28	85	0	0.3017	2.0000	0.8210	8	2.1924	0.3886	0
95	4	122	0.000	40.000	100.00	31	92	0	0.3891	1.5000	0.8210	8	1.9145	0.3918	0
96	4	123	0.000	45.000	100.00	39	93	0	0.3242	1.2500	0.8210	8	1.5969	0.3620	0
97	4	124	0.000	50.000	100.00	30	78	0	0.1280	1.5000	0.9120	9	1.4129	0.3009	0
98	4	125	0.000	55.000	100.00	24	63	0	0.1170	1.2500	0.9120	9	1.1532	0.3077	0
100	4	144	5.000	20.000	6.37	1	35	11	0.3703	4.0000	13.6780	14	3.5566	0.0263	0
101	4	145	5.000	25.000	56.32	4	55	18	0.3608	4.1250	13.6780	14	3.3319	0.2299	0
102	4	146	5.000	30.000	96.81	9	70	4	0.2664	2.8750	13.6780	14	2.7608	0.3172	0
103	4	147	5.000	35.000	100.00	19	81	0	0.2740	2.0000	0.8210	8	2.2384	0.3735	0
104	4	148	5.000	40.000	100.00	27	91	0	0.3593	1.5000	0.8210	8	1.9707	0.3857	0
105	4	149	5.000	45.000	100.00	37	95	0	0.3129	1.3750	0.8210	8	1.6186	0.3358	0
106	4	150	5.000	50.000	100.00	31	92	0	0.1127	1.6250	0.8210	8	1.4183	0.2743	0
107	4	151	5.000	55.000	100.00	26	73	0	0.1175	1.1250	0.9120	9	1.1491	0.2864	0
109	4	169	10.000	20.000	2.49	0	41	7	0.4023	2.6250	13.6780	14	3.4429	0.0250	0
110	4	170	10.000	25.000	58.17	2	54	17	0.2910	3.8750	13.6780	14	3.2047	0.2008	0
111	4	171	10.000	30.000	100.00	10	63	0	0.2714	2.7500	13.6780	14	2.6796	0.3505	0
112	4	172	10.000	35.000	100.00	17	77	0	0.2560	2.0000	0.9120	9	2.3061	0.3618	0
113	4	173	10.000	40.000	100.00	27	90	0	0.3596	1.6250	0.8210	8	2.0300	0.4002	0
114	4	174	10.000	45.000	100.00	33	91	0	0.3149	1.3750	0.8210	8	1.6402	0.3342	0
115	4	175	10.000	50.000	100.00	31	86	0	0.1140	1.6250	0.9120	9	1.4255	0.2855	0
116	4	176	10.000	55.000	100.00	27	77	0	0.1091	1.1250	0.9120	9	1.1503	0.2822	0
117	4	193	15.000	15.000	0.46	2	35	1	0.2555	2.1250	13.6780	14	3.2697	0.0154	0
118	4	194	15.000	20.000	13.04	1	40	14	0.3967	3.7500	13.6780	14	3.3292	0.0387	0
119	4	195	15.000	25.000	69.06	2	56	20	0.3607	3.1250	13.6780	14	3.0775	0.2501	0
120	4	196	15.000	30.000	99.54	10	68	1	0.2894	2.7500	4.5590	13	2.5984	0.3494	0
121	4	197	15.000	35.000	100.00	20	68	0	0.2669	1.8750	0.9120	9	2.3386	0.3545	0
122	4	198	15.000	40.000	100.00	27	78	0	0.3811	1.6250	0.8210	8	2.0625	0.3989	0
123	4	199	15.000	45.000	100.00	28	81	0	0.3412	1.5000	0.9120	9	1.6565	0.3557	0
124	4	200	15.000	50.000	100.00	24	78	0	0.1265	1.6250	0.9120	9	1.4404	0.2872	0
125	4	201	15.000	55.000	100.00	24	74	0	0.0941	1.1250	0.9120	9	1.1564	0.2838	0
126	5	17	20.000	15.000	1.56	2	41	5	0.5166	2.5000	13.6780	14	3.2480	0.0266	0
127	5	18	20.000	20.000	35.86	2	41	23	0.4336	3.7500	13.6780	14	3.2186	0.0640	0
128	5	19	20.000	25.000	81.23	4	56	15	0.4530	4.1250	13.6780	14	2.9531	0.3190	0
129	5	20	20.000	30.000	89.17	14	67	16	0.3523	2.3750	4.5590	13	2.5172	0.3960	0
130	5	21	20.000	35.000	100.00	23	75	0	0.3171	1.8750	0.8210	8	2.3223	0.3927	0
131	5	22	20.000	40.000	100.00	26	75	0	0.4265	1.6250	0.8210	8	2.0625	0.3886	0
132	5	23	20.000	45.000	100.00	28	74	0	0.3644	1.5000	0.9120	9	1.6890	0.3637	0
133	5	24	20.000	50.000	100.00	21	68	0	0.1500	1.5000	1.0940	10	1.4616	0.3067	0
134	5	25	20.000	55.000	100.00	21	72	0	0.0929	1.2500	0.8210	8	1.1693	0.2850	0
135	5	42	25.000	15.000	16.05	4	45	14	0.6430	3.8750	13.6780	14	3.2409	0.0575	0
136	5	43	25.000	20.000	54.92	5	48	16	0.6118	5.3750	13.6780	14	3.1252	0.2001	0
137	5	44	25.000	25.000	86.85	10	63	3	0.4214	4.1250	13.6780	14	2.8367	0.3179	0
138	5	45	25.000	30.000	100.00	18	70	0	0.3892	2.2500	13.6780	14	2.4360	0.3684	0
139	5	46	25.000	35.000	100.00	25	75	0	0.3435	1.8750	1.0940	10	2.2682	0.3681	0
140	5	47	25.000	40.000	100.00	25	66	0	0.4479	1.6250	0.9120	9	2.0219	0.3981	0
141	5	48	25.000	45.000	100.00	27	66	0	0.3783	1.5000	1.0940	10	1.6890	0.3581	0
142	5	49	25.000	50.000	100.00	18	63	0	0.1762	1.3750	1.0940	10	1.4616	0.3166	0
143	5	50	25.000	55.000	100.00	19	63	0	0.0998	1.2500	0.9120	9	1.1530	0.2828	0
144	5	67	30.000	15.000	22.31	5	42	14	0.8052	7.6250	13.6780	14	3.2504	0.0719	0
145	5	68	30.000	20.000	59.33	8	49	11	0.3810	4.5000	13.6780	14	3.0482	0.3366	0
146	5	69	30.000	25.000	82.56	16	61	6	0.3645	2.7500	13.6780	14	2.7256	0.3847	0
147	5	70	30.000	30.000	100.00	23	72	0	0.4116	2.0000	4.5590	13	2.3792	0.3915	0
148	5	71	30.000	35.000	100.00	27	78	0	0.3545	1.8750	1.8240	12	2.2141	0.3705	0
149	5	72	30.000	40.000	100.00	26	63	0	0.4291	1.6250	0.9120	9	1.9813	0.3728	0
150	5	73	30.000	45.000	99.77	21	62	1	0.4091	1.5000	4.5590	13	1.6565	0.4351	0
151	5	74	30.000	50.000	100.00	15	58	0	0.2448	1.5000	13.6780	14	1.4291	0.3038	0
152	5	75	30.000	55.000	99.77	13	56	1	0.1253	1.5000	13.6780	14	1.1368	0.2869	0
153	5	92	35.000	15.000	17.84	5	38	16	0.3534	4.1250	13.6780	14	3.3021	0.0622	0
154	5	93	35.000	20.000	51.45	10	43	9	0.3339	3.0000	13.6780	14	3.0616	0.2392	0
155	5	94	35.000	25.000	80.59	18	58	8	0.5376	2.2500	13.6780	14	2.7040	0.3552	0
156	5	95	35.000	30.000	99.07	23	63	1	0.5145	1.8750	13.6780	14	2.3386	0.3978	0
157	5	96	35.000	35.000	100.00	26	64	0	0.3862	2.0000	4.5590	13	2.1599	0.4048	0
158	5	97	35.000	40.000	100.00	17	57	0	0.4035	1.6250	4.5590	13	1.9407	0.3907	0
159	5	98	35.000	45.000	100.00	14	50	0	0.4520	1.3750	13.6780	14	1.6294	0.3805	0
160	5	99	35.000	50.000	92.00	9	47	15	0.3143	2.8750	13.6780	14	1.3723	0.2385	0
161	5	100	35.000	55.000	97.97	10	48	6	0.1945	2.5000	13.6780	14	1.1124	0.2694	0

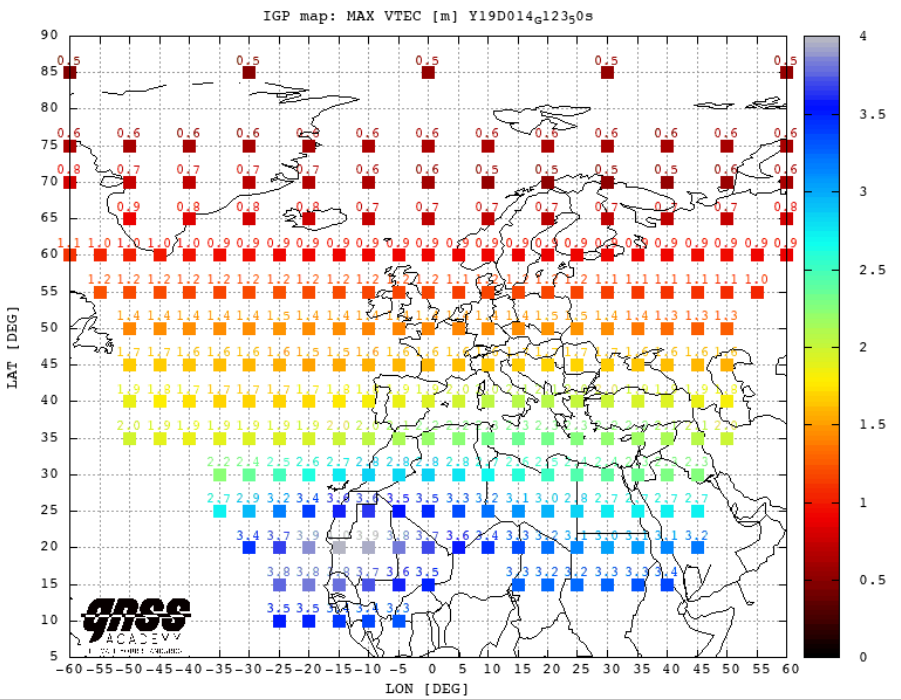
162	5	118	40.000	15.000	2.03	1	33	3	0.7680	4.8750	13.6780	14	3.3730	0.0332	0
163	5	119	40.000	20.000	25.43	3	40	18	0.7842	3.0000	13.6780	14	3.1289	0.1580	0
164	5	120	40.000	25.000	66.40	11	51	15	0.7067	4.0000	13.6780	14	2.7013	0.3786	0
165	5	121	40.000	30.000	81.58	17	53	15	0.6675	3.7500	13.6780	14	2.2980	0.3498	0
166	5	122	40.000	35.000	92.24	17	51	11	0.4871	3.0000	13.6780	14	2.1058	0.4153	0
167	5	123	40.000	40.000	95.25	11	52	5	0.4572	2.0000	13.6780	14	1.9001	0.3591	0
168	5	124	40.000	45.000	92.64	8	44	12	0.4789	1.5000	13.6780	14	1.6078	0.3801	0
169	5	125	40.000	50.000	65.01	5	45	28	0.3261	3.0000	13.6780	14	1.3154	0.1545	0
170	5	126	40.000	55.000	93.57	6	45	16	0.2503	3.1250	13.6780	14	1.0989	0.2361	0
172	5	144	45.000	20.000	0.93	1	32	2	0.8705	2.2500	13.6780	14	3.1993	0.0260	0
173	5	145	45.000	25.000	11.24	2	43	9	0.6900	3.1250	13.6780	14	2.7040	0.0342	0
174	5	146	45.000	30.000	19.12	6	45	19	0.6051	2.8750	13.6780	14	2.2575	0.0611	0
175	5	147	45.000	35.000	41.71	8	41	26	0.4948	3.0000	13.6780	14	2.0517	0.2380	0
176	5	148	45.000	40.000	47.86	6	39	29	0.5375	2.3750	13.6780	14	1.8595	0.2447	0
177	5	149	45.000	45.000	38.18	2	39	32	0.5084	1.6250	13.6780	14	1.5861	0.1608	0
178	5	150	45.000	50.000	23.17	2	43	25	0.3464	2.3750	13.6780	14	1.2750	0.0529	0
179	5	151	45.000	55.000	50.87	2	46	23	0.3727	3.1250	13.6780	14	1.0881	0.2133	0
183	5	172	50.000	35.000	1.85	0	34	1	0.1246	1.7500	13.6780	14	1.9975	0.0135	0
184	5	173	50.000	40.000	0.70	0	31	3	0.5475	1.3750	13.6780	14	1.8189	0.0215	0
185	5	174	50.000	45.000	0.81	0	32	2	0.2593	1.5000	13.6780	14	1.5645	0.0163	0
186	5	175	50.000	50.000	4.11	0	34	8	0.2193	1.6250	13.6780	14	1.2667	0.0212	0
187	5	176	50.000	55.000	12.40	0	38	19	0.3238	1.8750	13.6780	14	1.0612	0.0609	0
195	5	201	55.000	55.000	0.52	0	30	1	0.4218	1.5000	13.6780	14	1.0376	0.0193	0
208	9	25	-60.000	60.000	1.16	0	27	1	0.0121	0.3750	13.6780	14	1.0827	0.0114	0
209	9	26	-55.000	60.000	2.55	0	32	3	0.2026	1.0000	13.6780	14	1.0475	0.0197	0
210	9	27	-50.000	60.000	3.71	0	30	4	0.3076	0.8750	13.6780	14	1.0123	0.0188	0
211	9	28	-45.000	60.000	17.27	1	30	18	0.4190	1.5000	13.6780	14	0.9771	0.0448	0
212	9	29	-40.000	60.000	54.06	1	33	22	0.5204	2.5000	13.6780	14	0.9582	0.1568	0
213	9	30	-35.000	60.000	84.41	3	31	14	0.4681	2.1250	13.6780	14	0.9419	0.2813	0
214	9	31	-30.000	60.000	94.32	4	32	7	0.4293	1.7500	13.6780	14	0.9257	0.3434	0
215	9	32	-25.000	60.000	97.05	7	41	3	0.3560	1.6250	1.8240	12	0.9094	0.3680	0
216	9	33	-20.000	60.000	100.00	10	49	0	0.2424	1.3750	1.3680	11	0.9094	0.3259	0
217	9	34	-15.000	60.000	100.00	12	54	0	0.1667	1.2500	1.3680	11	0.9094	0.2913	0
218	9	35	-10.000	60.000	100.00	11	49	0	0.1259	1.1250	1.0940	10	0.9094	0.2826	0
219	9	36	-5.000	60.000	100.00	12	57	0	0.1265	1.0000	1.0940	10	0.9094	0.2932	0
220	9	37	0.000	60.000	100.00	15	50	0	0.1369	1.0000	0.9120	9	0.9094	0.2792	0
221	9	38	5.000	60.000	100.00	18	54	0	0.1404	0.8750	0.9120	9	0.9094	0.2736	0
222	9	39	10.000	60.000	100.00	22	64	0	0.1457	0.7500	0.9120	9	0.9015	0.2798	0
223	9	40	15.000	60.000	100.00	24	70	0	0.1451	0.7500	0.9120	9	0.8974	0.2736	0
224	9	41	20.000	60.000	100.00	22	66	0	0.1441	0.8750	0.8210	8	0.8993	0.2922	0
225	9	42	25.000	60.000	100.00	21	63	0	0.1355	0.8750	0.9120	9	0.9040	0.2719	0
226	9	43	30.000	60.000	100.00	13	54	0	0.1342	1.0000	1.0940	10	0.9094	0.2702	0
227	9	44	35.000	60.000	100.00	10	50	0	0.1455	1.0000	1.8240	12	0.9149	0.2867	0
228	9	45	40.000	60.000	97.86	6	50	3	0.1583	1.1250	13.6780	14	0.9203	0.2514	0
229	9	46	45.000	60.000	87.78	2	47	16	0.2071	1.5000	13.6780	14	0.9257	0.2905	0
230	9	47	50.000	60.000	45.89	0	37	25	0.2735	1.7500	13.6780	14	0.9257	0.2709	0
231	9	48	55.000	60.000	9.85	0	33	11	0.3968	1.8750	13.6780	14	0.9098	0.0509	0
232	9	49	60.000	60.000	0.23	0	30	1	0.1130	0.3750	13.6780	14	0.8959	0.0128	0
236	9	86	-50.000	65.000	15.53	0	29	10	0.5958	1.6250	13.6780	14	0.8824	0.0284	0
237	9	87	-40.000	65.000	76.19	0	30	16	0.5072	1.7500	13.6780	14	0.8337	0.3381	0
238	9	88	-30.000	65.000	98.67	5	33	1	0.4241	1.3750	1.8240	12	0.7958	0.3582	0
239	9	89	-20.000	65.000	100.00	12	48	0	0.3946	1.1250	1.3680	11	0.7633	0.3711	0
240	9	90	-10.000	65.000	100.00	11	47	0	0.2870	1.1250	1.0940	10	0.7362	0.3329	0
241	9	91	0.000	65.000	100.00	9	49	0	0.1808	1.0000	0.9120	9	0.7200	0.3059	0
242	9	92	10.000	65.000	100.00	18	60	0	0.1656	0.8750	1.0940	10	0.7044	0.3152	0
243	9	93	20.000	65.000	100.00	22	60	0	0.1689	0.7500	0.9120	9	0.6983	0.2719	0
244	9	94	30.000	65.000	100.00	13	59	0	0.1660	0.7500	1.0940	10	0.7064	0.2732	0
245	9	95	40.000	65.000	99.77	7	50	1	0.1718	0.8750	4.5590	13	0.7227	0.2844	0
246	9	96	50.000	65.000	82.79	0	35	18	0.2551	1.2500	13.6780	14	0.7470	0.2731	0
247	9	97	60.000	65.000	12.69	0	29	12	0.6270	2.0000	13.6780	14	0.7795	0.0605	0
250	9	121	-60.000	70.000	2.55	0	19	4	0.6022	1.6250	13.6780	14	0.7958	0.0264	0
251	9	122	-50.000	70.000	30.65	0	22	19	0.4825	2.3750	13.6780	14	0.7443	0.0759	0
252	9	123	-40.000	70.000	73.58	1	26	27	0.5119	5.5000	13.6780	14	0.7100	0.3929	0
253	9	124	-30.000	70.000	95.08	5	38	5	0.3855	1.6250	13.6780	14	0.6875	0.3896	0
254	9	125	-20.000	70.000	100.00	11	38	0	0.3189	1.2500	1.3680	11	0.6658	0.3753	0
255	9	126	-10.000	70.000	100.00	10	43	0	0.2108	1.1250	1.0940	10	0.6334	0.3513	0
256	9	127	0.000	70.000	100.00	11	44	0	0.1526	0.8750	1.3680	11	0.5901	0.3245	0
257	9	128	10.000	70.000	100.00	13	47	0	0.1406	0.8750	1.3680	11	0.5467	0.3274	0
258	9	129	20.000	70.000	100.00	17	51	0	0.1158	0.6250	1.8240	12	0.5217	0.2689	0
259	9	130	30.000	70.000	100.00	11	52	0	0.1250	0.6250	1.3680	11	0.5197	0.3371	0
260	9	131	40.000	70.000	100.00	6	40	0	0.1273	0.8750	4.5590	13	0.5251	0.3279	0
261	9	132	50.000	70.000	87.14	0	31	14	0.1766	1.2500	13.6780	14	0.5630	0.2612	0
262	9	133	60.000	70.000	46.12	0	26	21	0.4020	1.8750	13.6780	14	0.6171	0.1494	0
263	9	134	70.000	70.000	4.58	0	24	7	0.7302	1.8750	13.6780	14	0.6658	0.0287	0
265	9	156	-70.000	75.000	0.41	0	17	2	0.4403	1.1250	13.6780	14	0.6828	0.0186	0
266	9	157	-60.000	75.000	7.71	0	18	8	0.3371	1.0000	13.6780	14	0.6415	0.0179	0
267	9	158	-50.000	75.000	33.84	0	20	17	0.4562	2.5000	13.6780	14	0.6099	0.1037	0
268	9	159	-40.000	75.000	84.18	0	22	20	0.4496	2.5000	13.6780	14	0.6036	0.3679	0
269	9	160	-30.000	75.000	90.44	2	32	15	0.3006	1.5000	13.6780	14	0.6009	0.3774	0
270	9	161	-20.000	75.000	99.13	4	31	1	0.1660	1.0000	4.5590	13	0.6171	0.3174	0
271	9	162	-10.000	75.000	100.00	6	29	0	0.0915	0.8750	4.5590	13	0.6334	0.2812	0
272	9	163	0.000	75.000	100.00	9	35	0	0.0780	0.7500	4.5590	13	0.6442	0.2797	0
273	9	164	10.000	75.000	100.00	7	34	0	0.0835	0.7500	4.5590	13	0.6334	0.3040	0
274	9	165	20.000	75.000	100.00	9	34	0	0.0888	0.7500	4.5590	13	0.6252	0.2767	0
275	9	166	30.000	75.000	100.00	7	33	0	0.0834	0.8750	1.3680	11	0.6198	0.2826	0
276	9	167	40.000	75.000	100.00	4	33	0	0.0968	0.7500	4.5590	13	0.6036	0.2933	0
277	9	168	50.000	75.000	92.64	0	28	15	0.1479	1.3750	13.6780	14	0.6117	0.3173	0
278	9	169	60.000	75.000	85.98	0	24	23	0.2590	2.0000	13.6780	14	0.6202	0.2025	0
279	9	170	70.000	75.000	33.20	0	23	24	0.5218	3.1250	13.6780	14	0.6496	0.1227	0
280	9	171	80.000	75.000	1.16	0	19	2	0.5186	1.1250	13.6780	14	0.6658	0.0193	0
281	9	184	-90.000	85.000	0.87	0	6	3	0.1022	0.3750	13.6780	14	0.5359	0.0128	0
282	9	185	-60.000	85.000	16.86	0	9	21	0.4363	1.2500	13.6780	14	0.4554	0.0588	0
283	9	186	-30.000	85.000	51.51	0	9	24	0.2781	1.2500	13.6780	14	0.4872	0.1569	0
284	9	187	0.000	85.000	77.58	1	14	22	0.1703	1.2500	13.6780	14	0.5359	0.2499	0
285	9	188	30.000	85.000	61.12	0	16	26	0.1073	0.8750	13.6780	14	0.5359	0.2166	0
286	9	189	60.000	85.000	33.89	0	13	32	0.1546	1.1250	13.6780	14	0.5366	0.1222	0
287	9	190	90.000	85.000	6.66	0	8	16	0.1833	0.8750	13.6780	14	0.6009	0.0386	0

T2. PLOTS STATS	STATISTICS PLOTS on IGPs	
MAPS PLOTs	Plot a Map with all the columns of IGP Statistic file. Note that IGPs represented in all the maps are those that have been monitored at least once in the day. Those that are never monitored during the day have been filtered out. Please take care on the IGP Monitoring status; not to take into account those periods in the day where the IGP is Not Monitored or DON'T USE. Check flag epochs with the status to ONE.	
MONITORING		
MIN-NIPPs		

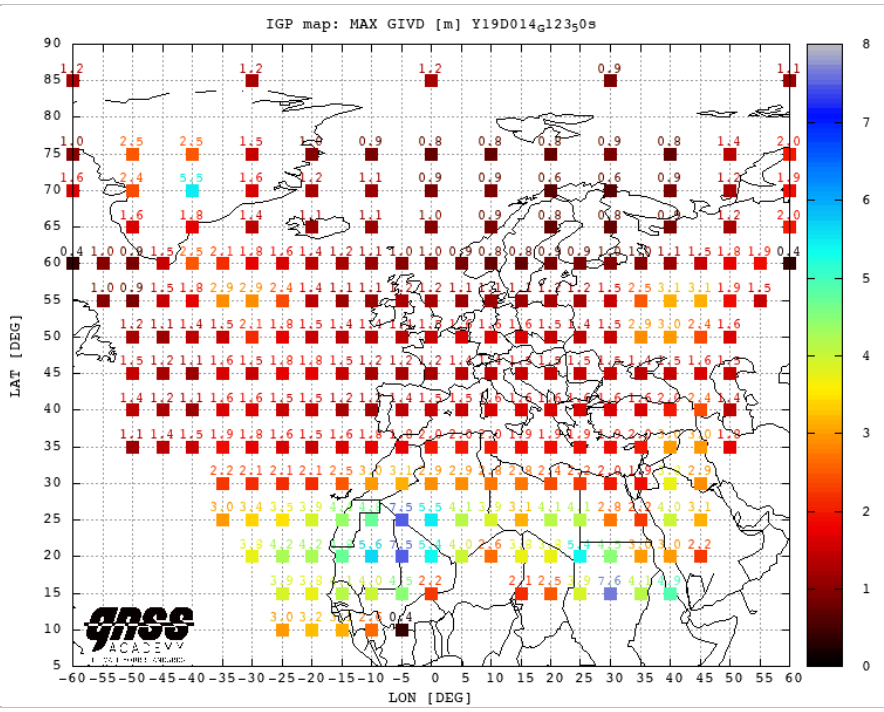
MAX-IPPs



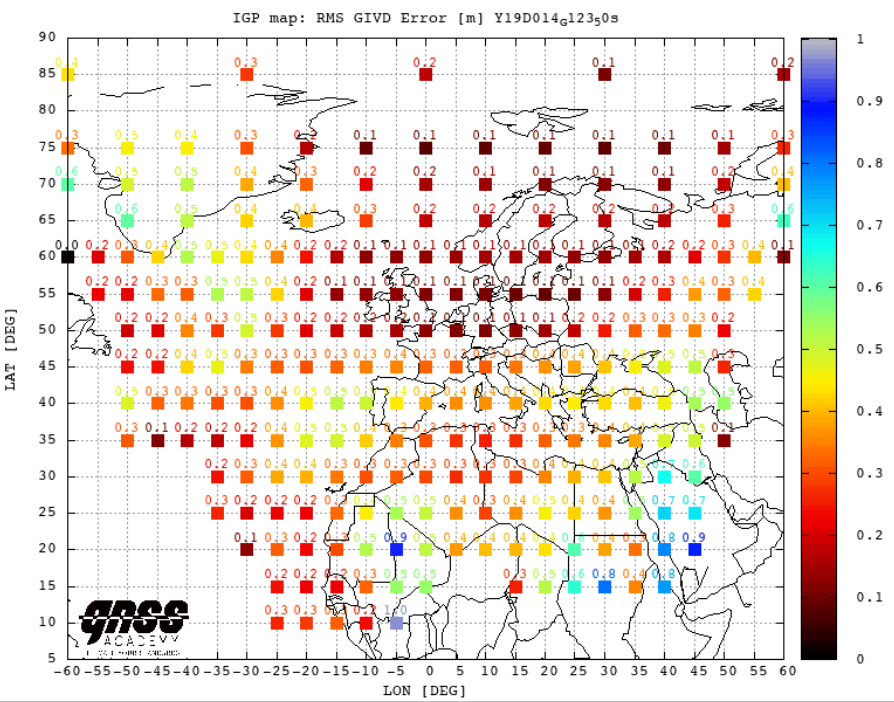
MAX VTEC



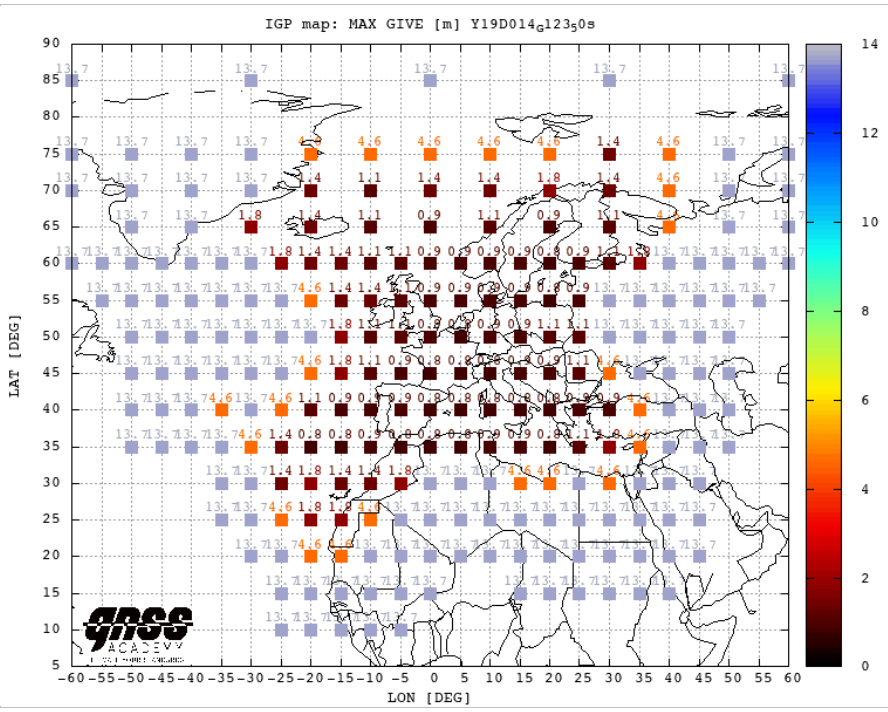
MAX GIVD



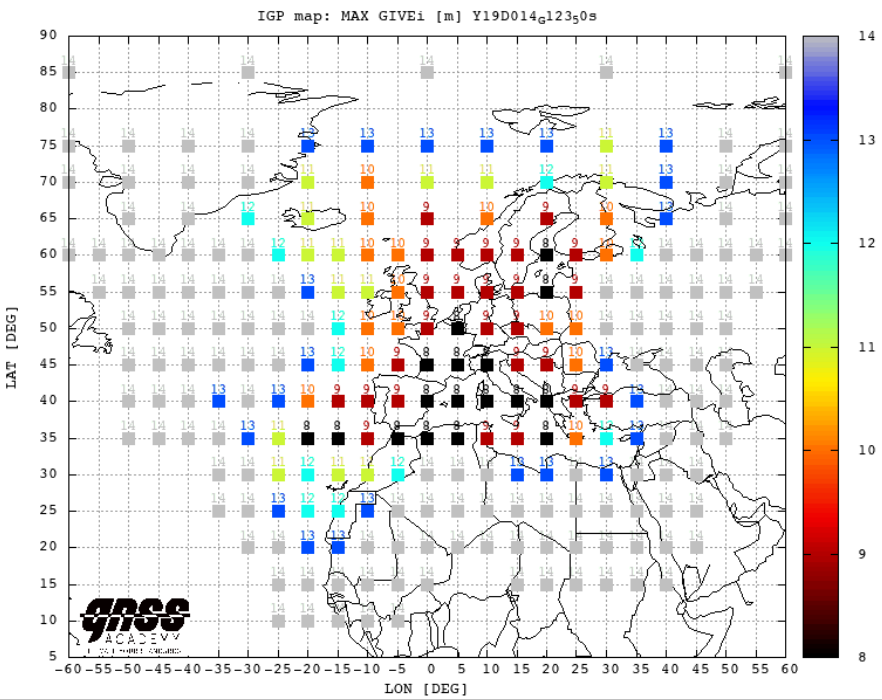
RMS-GIVDE



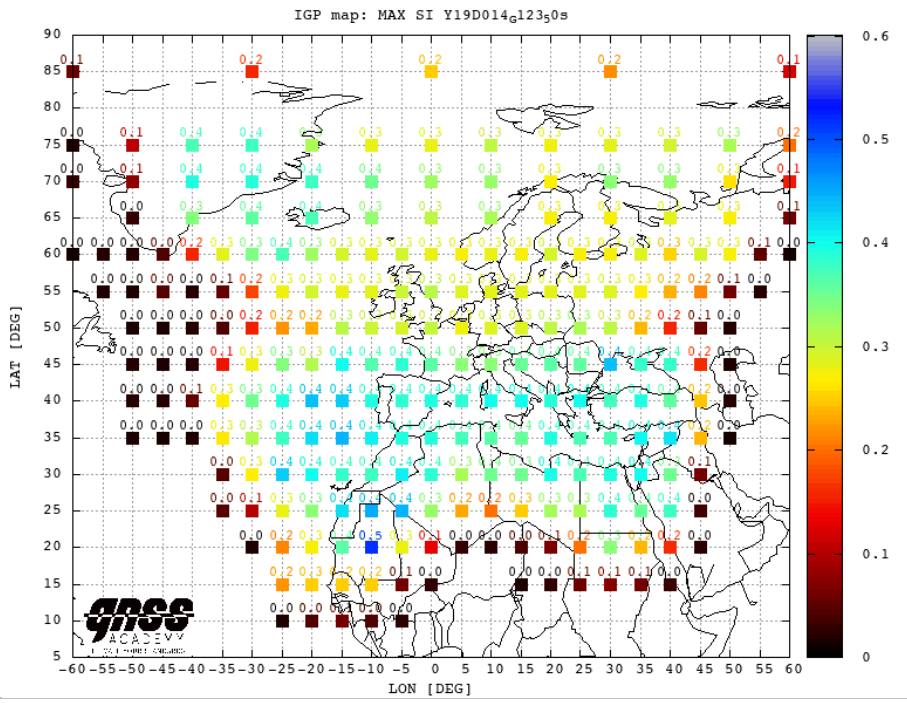
MAX GIVE



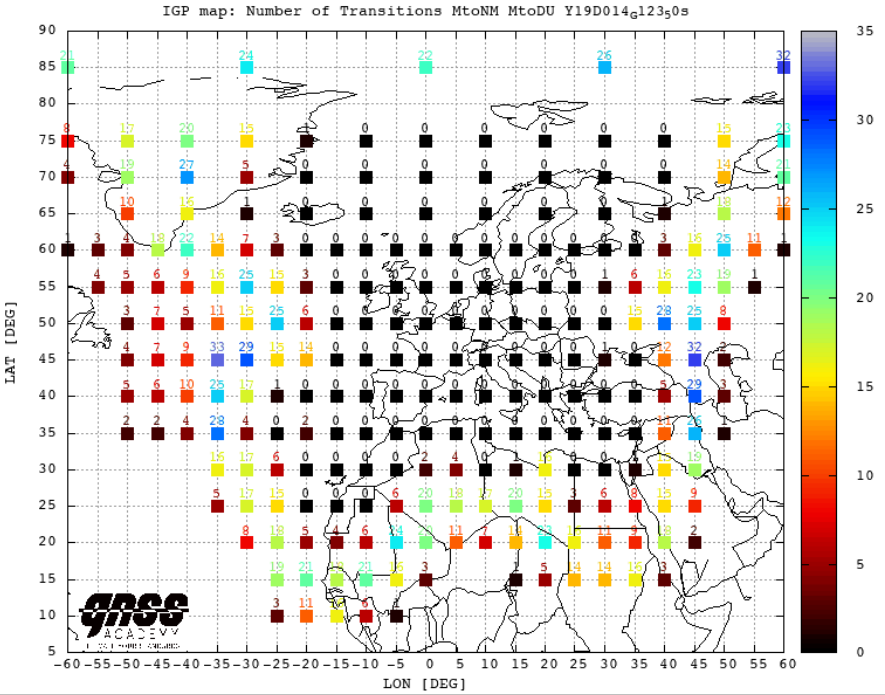
MAX GIVEi

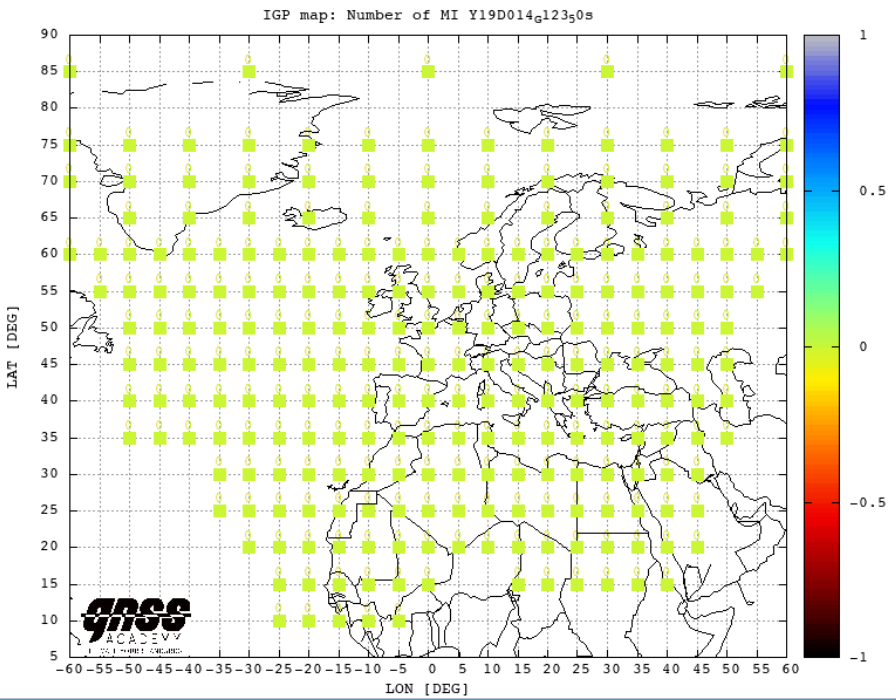
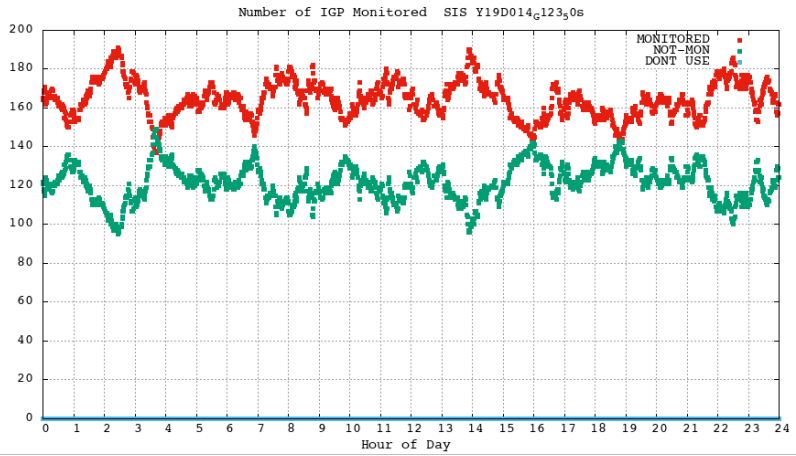


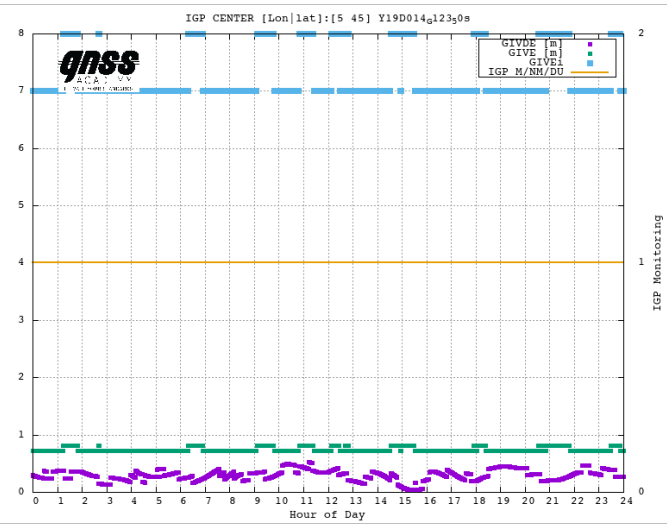
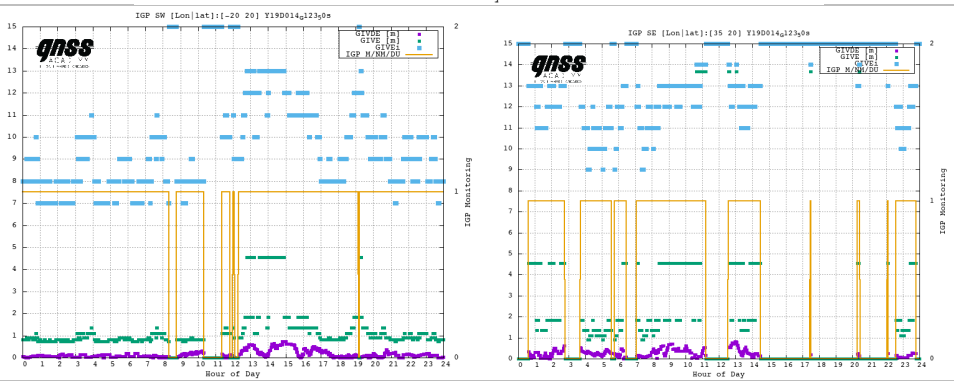
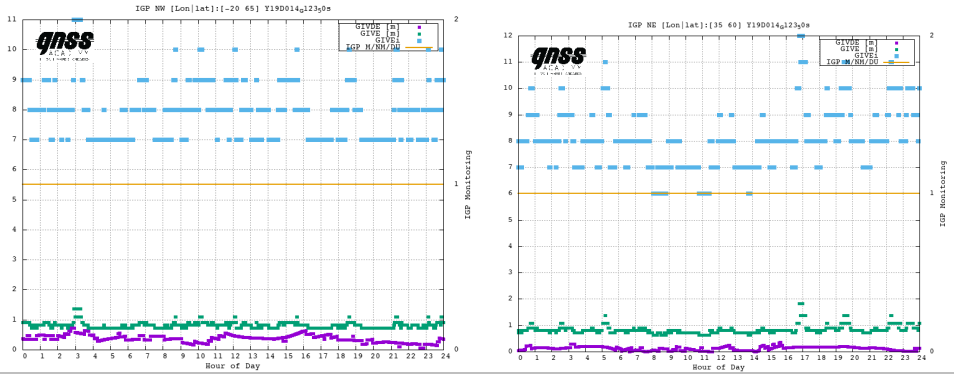
MAX SI

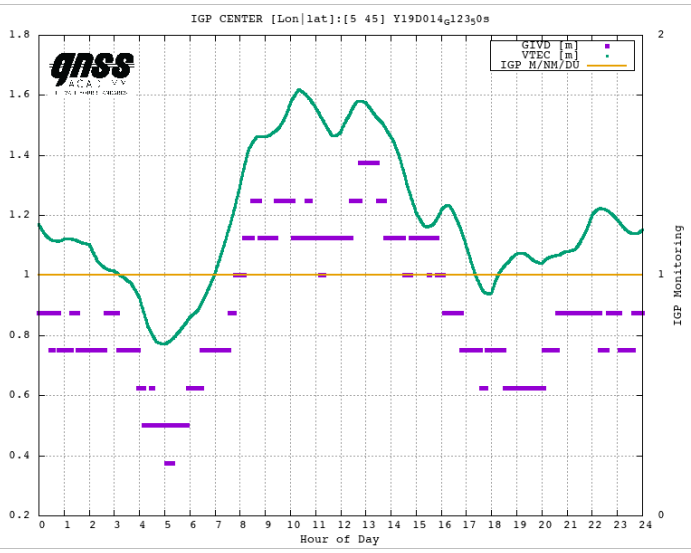
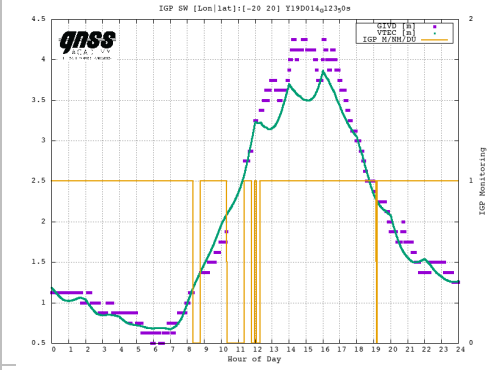
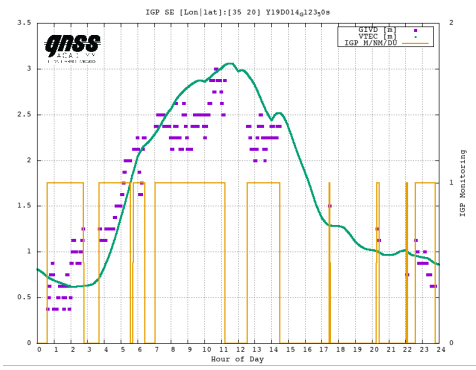
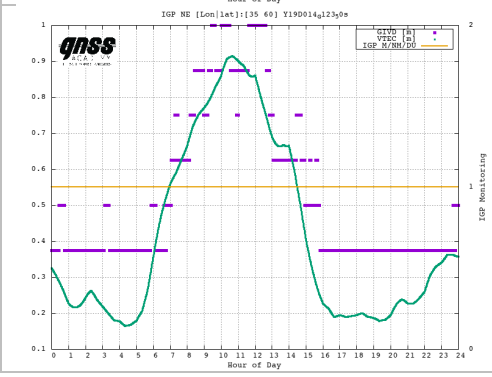
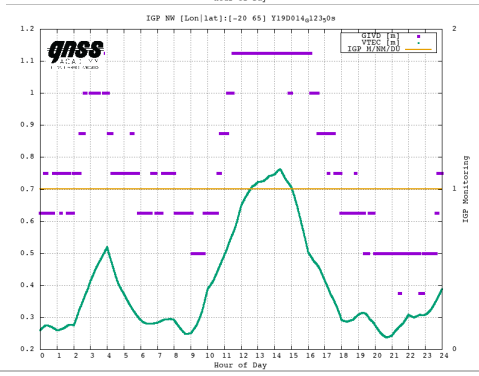


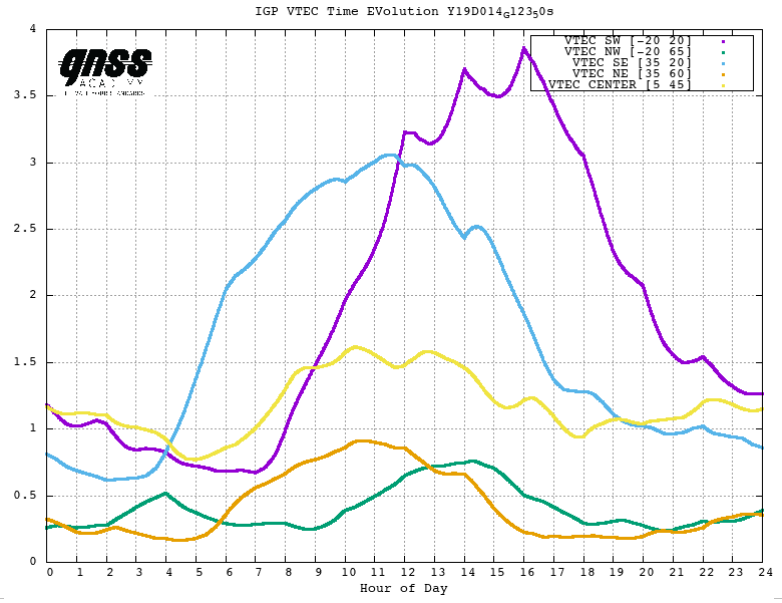
NTRANS



NMI	
T3. PLOTS Vs. TIME	**TIME PLOTS (OPTIONAL) from IGP_INFO_FILE**
MONITORING	Plot the instantaneous number of IGP monitored as a function of the hour of the day reflecting also the Number of Not Monitored IGPs and DU 
IGP Selection in 5 different corners of EVCAC	Select 5 IGP across ECAC and plot time evolution: **IGP1 CENTER ECAC (CENTER): 5E45N** **IGP2 SOUTH WEST (SW): 20W20N** **IGP3 SOUTH EAST (SE): 35E20N** **IGP4 NORTH WEST (NW): 20W65N** **IGP5 NORTH EAST (NE): 35E60N**
GIVDE, GIVE	Plot GIVDE, GIVE, GIVEi and Monitoring flag along the hour of the day. Not that in this picture, the Monitoring Status is represented in right hand side axis. (Not mandatory)

IGP Center	
IGPs Southern	
IGPs Northern	
GIVD and VTEC	Plot GIVD and VTEC Evolution for all the 5 IGPs along the day. *Note that in this picture, the Monitoring Status is represented in right hand side axis. (Not mandatory)*

IGP Center	
IGP South	 
IGP North	 

5 IGPs VTEC	
ALL 5 IGPs Safety Index SI= GIVDE/5.33 GIVE