

Determinação do Potencial de Energia Solar e sua Variabilidade nos Açores

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Determinação do Potencial de Energia Solar e sua Variabilidade nos Açores

- Instrumentos e estações
- Procesamento de dados
- Resultados

Instruments & Data Acquisition



- Os **piranómetros** são instrumentos especialmente concebidos para a medição regular e contínua da radiação global entre $0.3 \mu\text{m}$ e $3.0 \mu\text{m}$;
- Os piranómetros instalados nas estações do IM são piranómetros termoelétricos Kipp & Zonen CM11 (“high quality” - Guide to meteorological Instruments and Methods of Observation, VI ed.).
- AWS MILUS 500 (Vaisala):
 - Intervalo de amostragem: < 30 seg
 - Tempo de integração: 10 min
 - Tempo de observação: TSV

Estações

Corvo



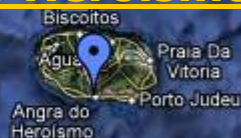
Flores



Graciosa



A. do Heroísmo



Pico



Horta

Nordeste



P. Delgada

S. Maria



Calibração & Processamento de dados & Arquivo

- Calibração dos sensores de radiação em acordo com a norma ISO 9846:1993(E);
Última calibração realizada no período Oct-Nov/2009.
- Aplicação dos Critérios Controle e Avaliação de Qualidade;
- Arquivo e dessiminação internacional dos dados.

Processamento para dados de base e 10' data:

- extrair e ordenar a informação de base (valores médios em 10 minutos) registada em ficheiros diários (TSV). Cada ficheiro diário contém toda a informação de radiação da rede (registos não formatados), sendo necessário separar esta informação e ordená-la em ficheiros mensais de estações, por forma a serem posteriormente processados.

- controle das observações de 10':

c
c **iflag = 0 : (good)**
c **= 1 : > 0.9*x0 (bad)**
c **= 2 : 0.8*x0 = <x> 0.9*x0 (suspect)**

c
 x0: Irradiância no topo da atmosfera

Processamento da informação horária (1):

- Construção dos ficheiros horários [*.hor]:
- Os totais correspondentes a uma determinada hora H referem-se aos valores compreendidos entre as horas H e H+1. Por exemplo, o total para as 5 horas 4:10, 4:20, ..., 4:50 e 5:00.
- Valores horários iguais a zero são considerados falha (-1).

Processamento da informação horária (1):

- Construção dos ficheiros horários [***.ho1**]:

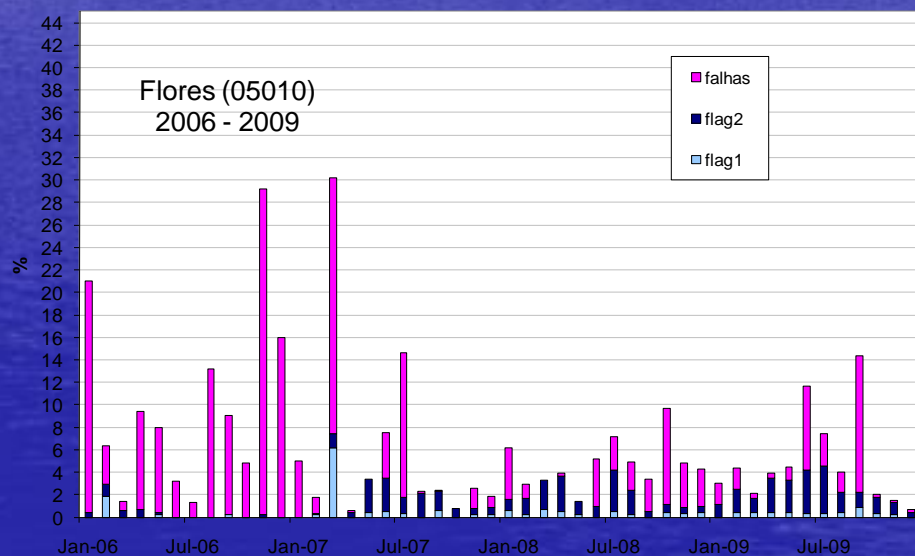
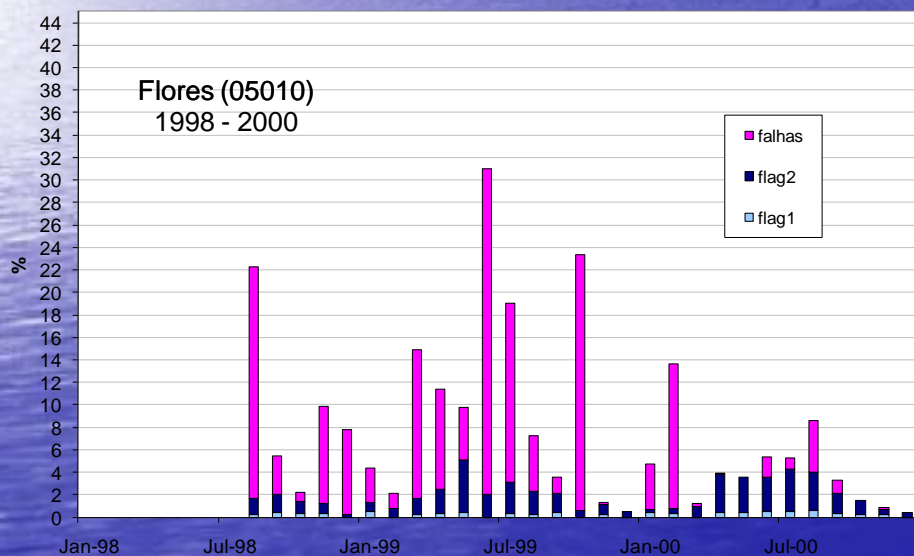
Valores horários no período entre o nascer e pôr do Sol considerados zero (0).

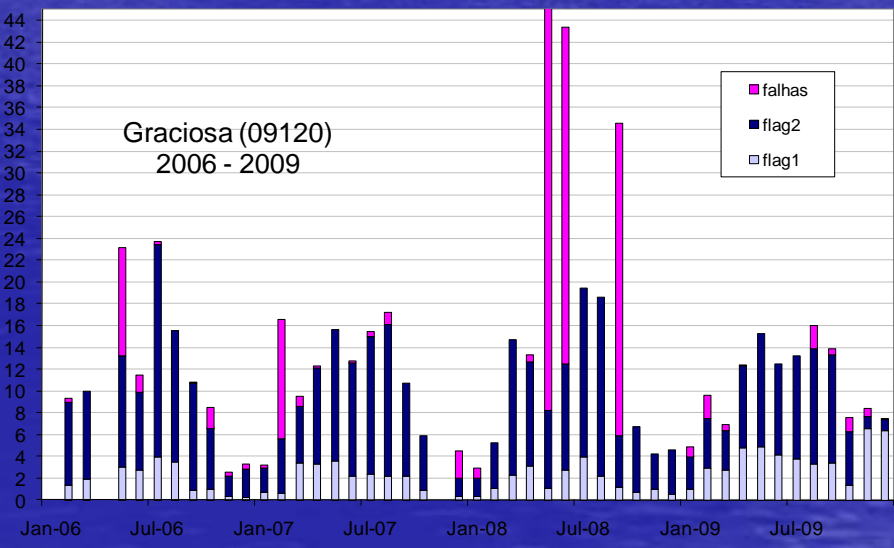
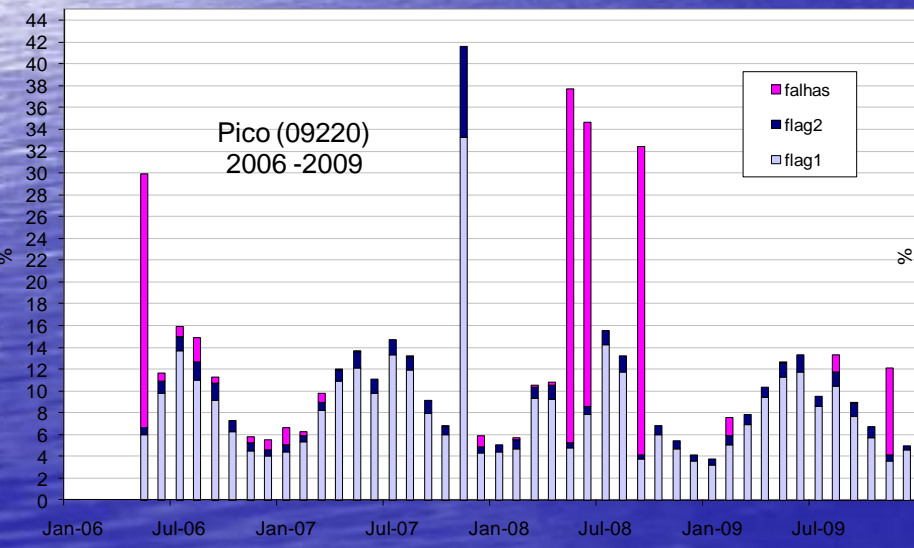
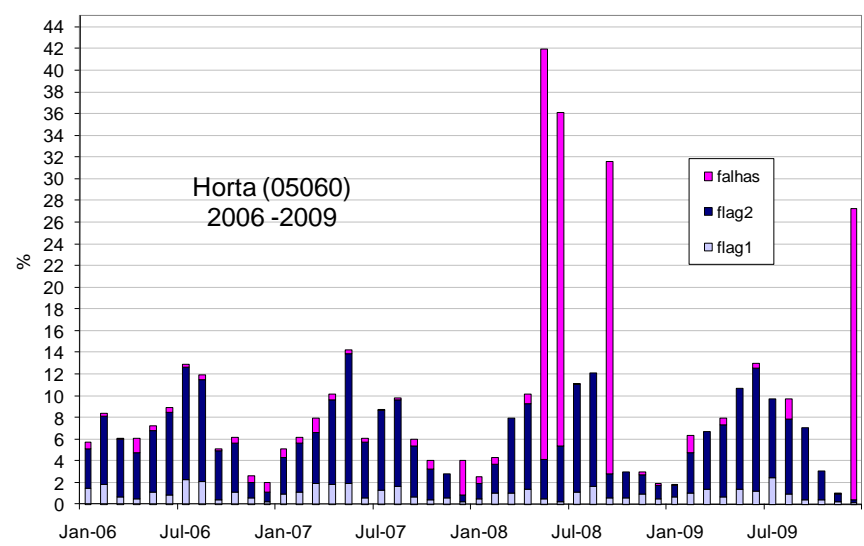
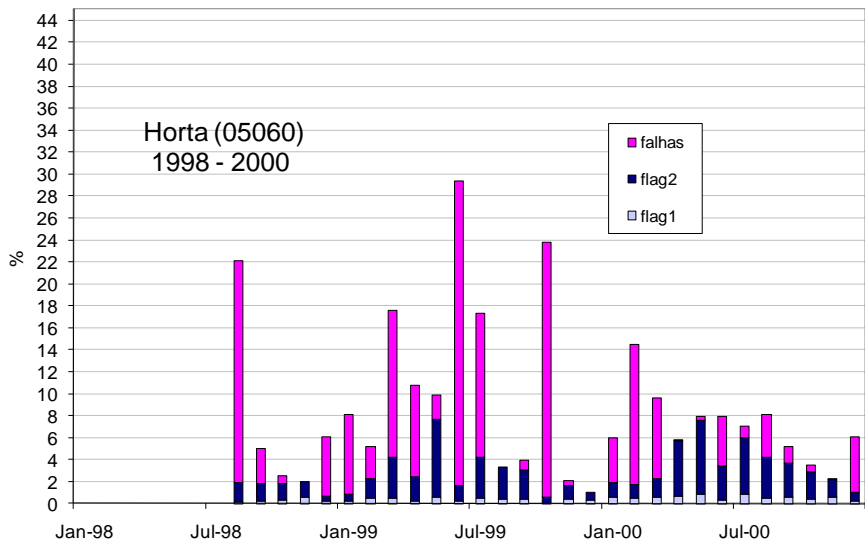
C

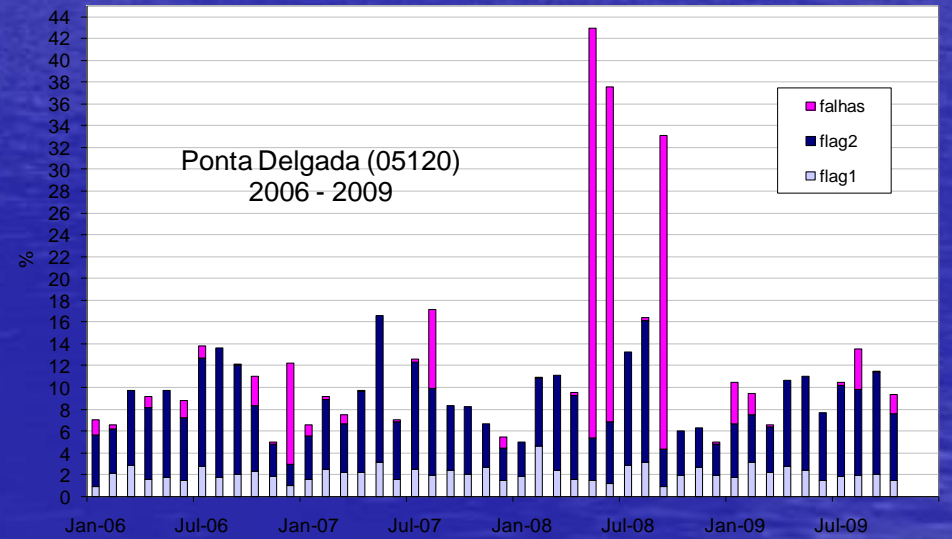
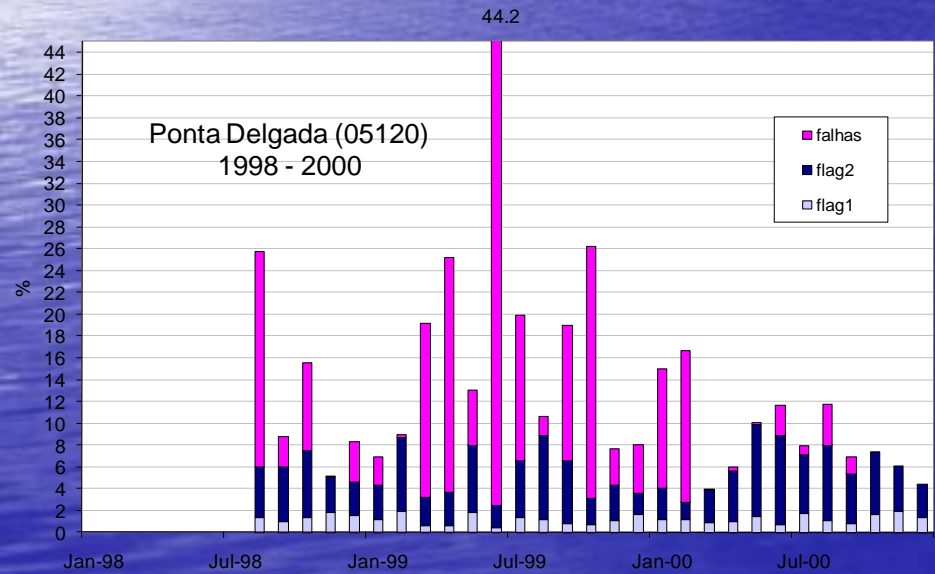
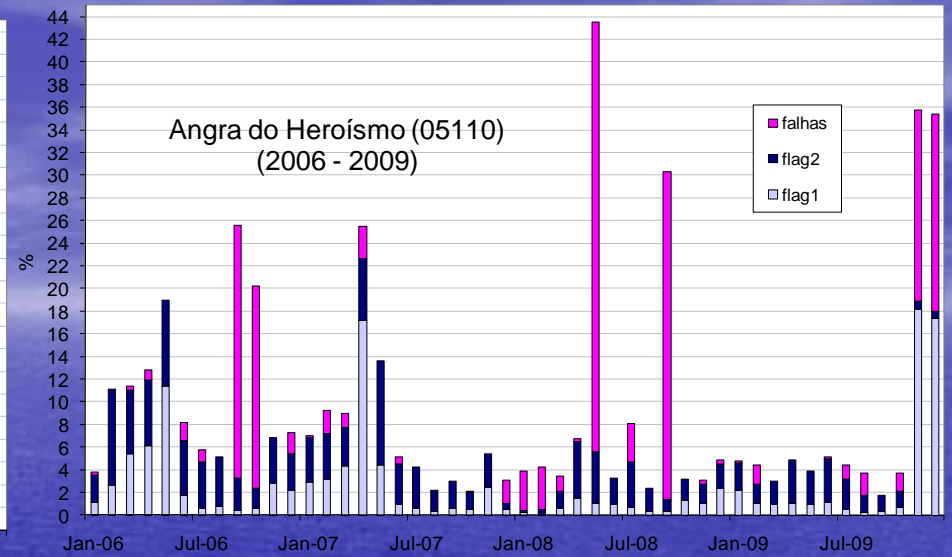
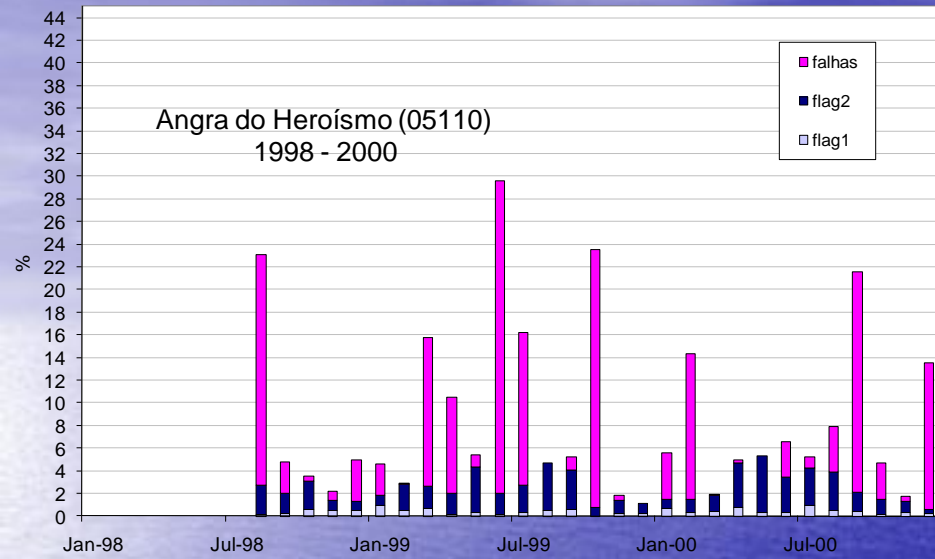
```
if(za.gt.90..or.za.lt.-90.)then
  x(k)=0.
  else if(x(k).eq.0.)then
    x(k)=-1.
  endif
```

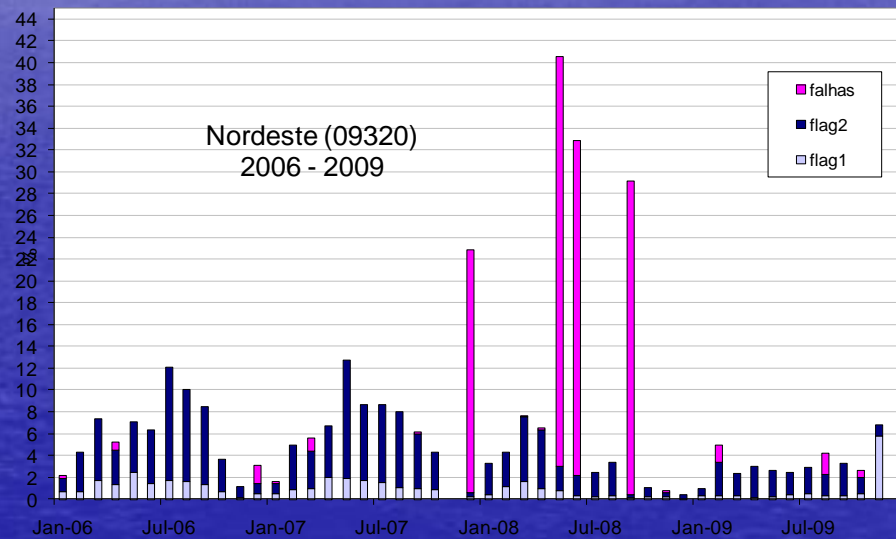
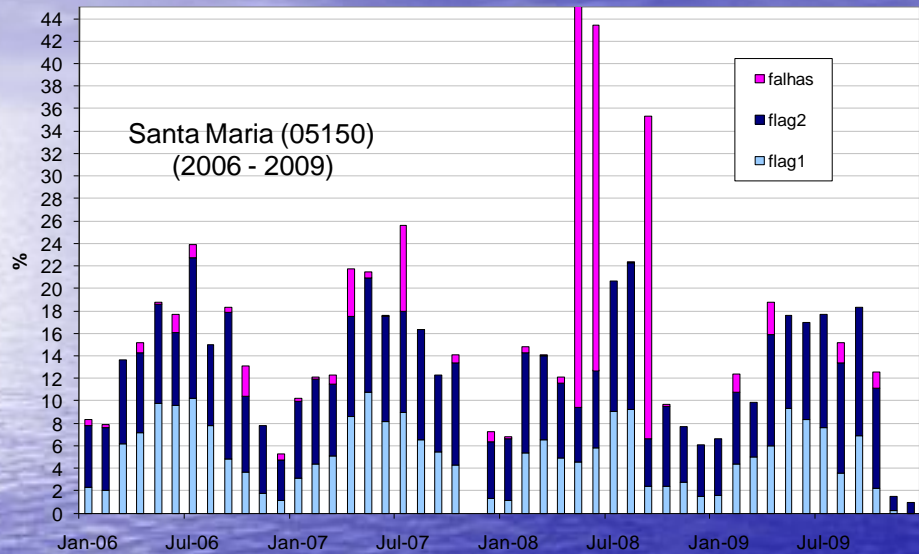
C

Funcionamento dos piranómetros (2000-2009)



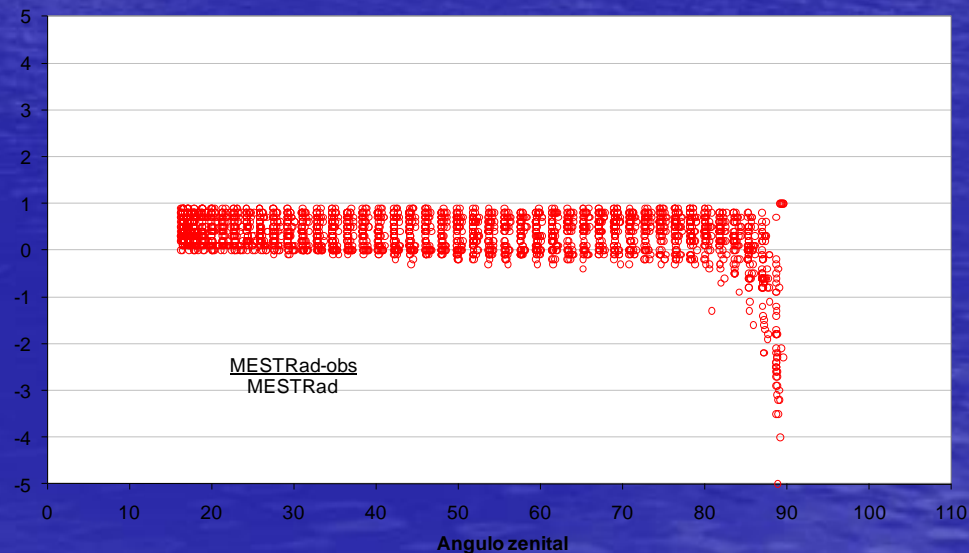
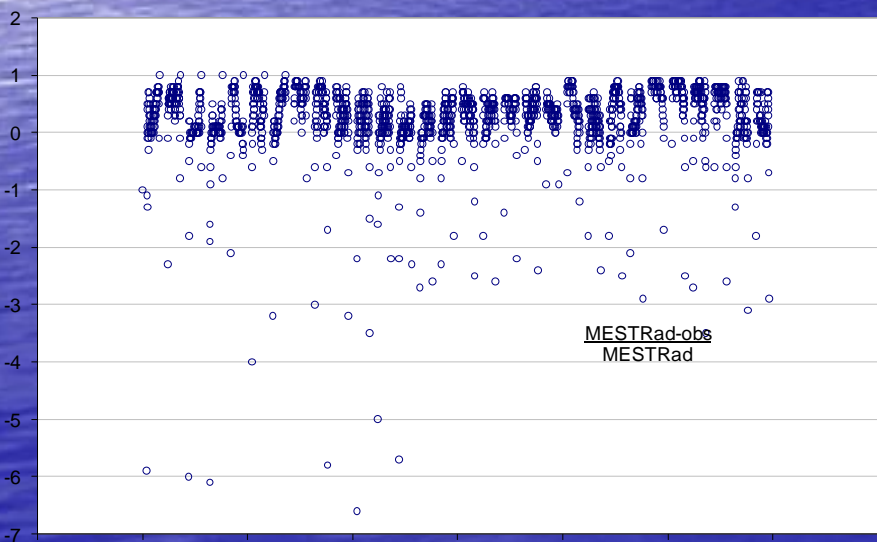
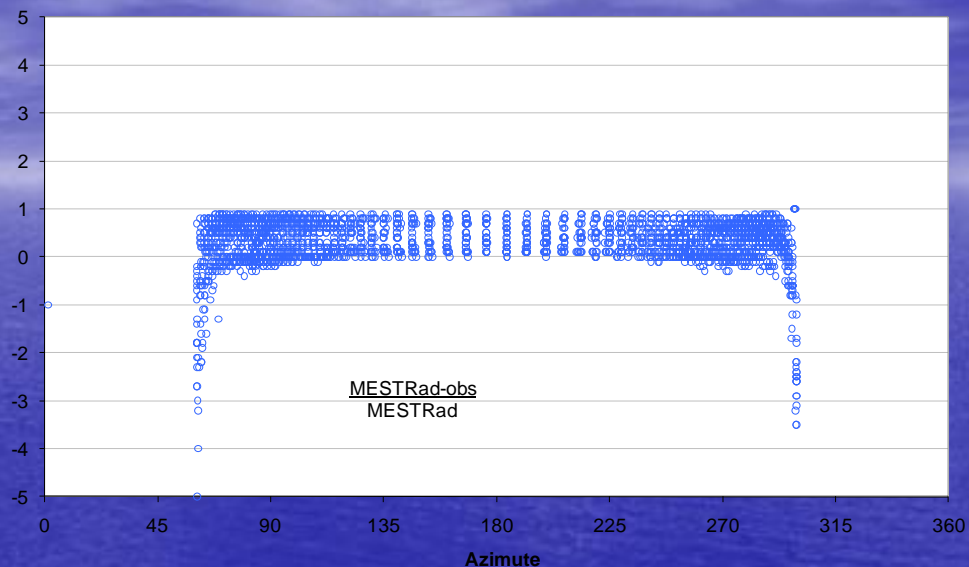






Flores – Radiação Global (10 minutos)

Desvios (%) das medições em relação ao model MESTRad.

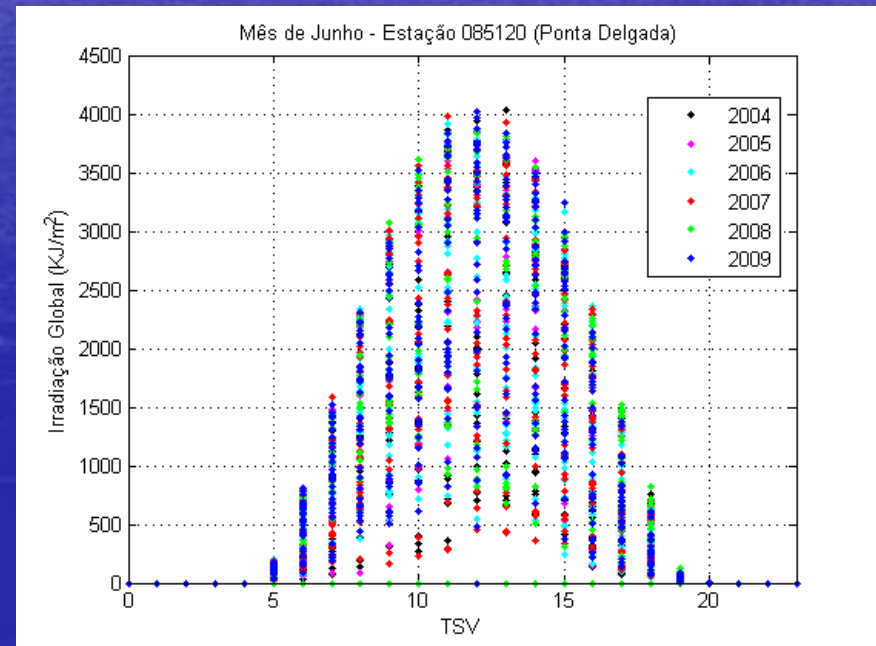
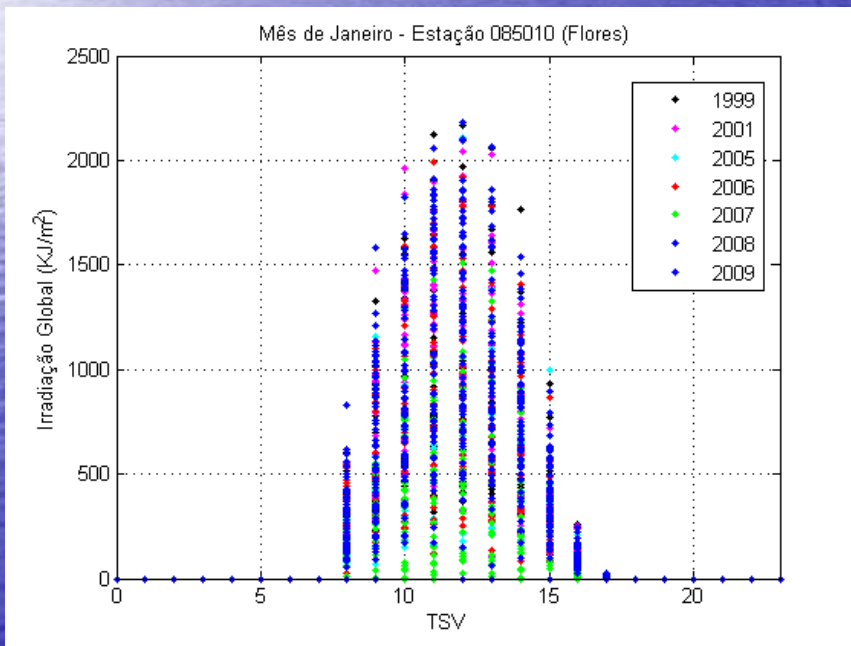


27-5-09 0:00 1-6-09 0:00 6-6-09 0:00 11-6-09 0:00 16-6-09 0:00 21-6-09 0:00 26-6-09 0:00 1-7-09 0:00 6-7-09 0:00

Resultados (I)

(1999-2000)

Irradiação horária (kJ/m²)



Resultados (II)

(1999-2000)

Tabelas da Irradiação Global Diária (Wh/m2)

Daily Global Irradiation values (Wh/m2)

Average, maximum, minimum and number of years

Station ID: 501

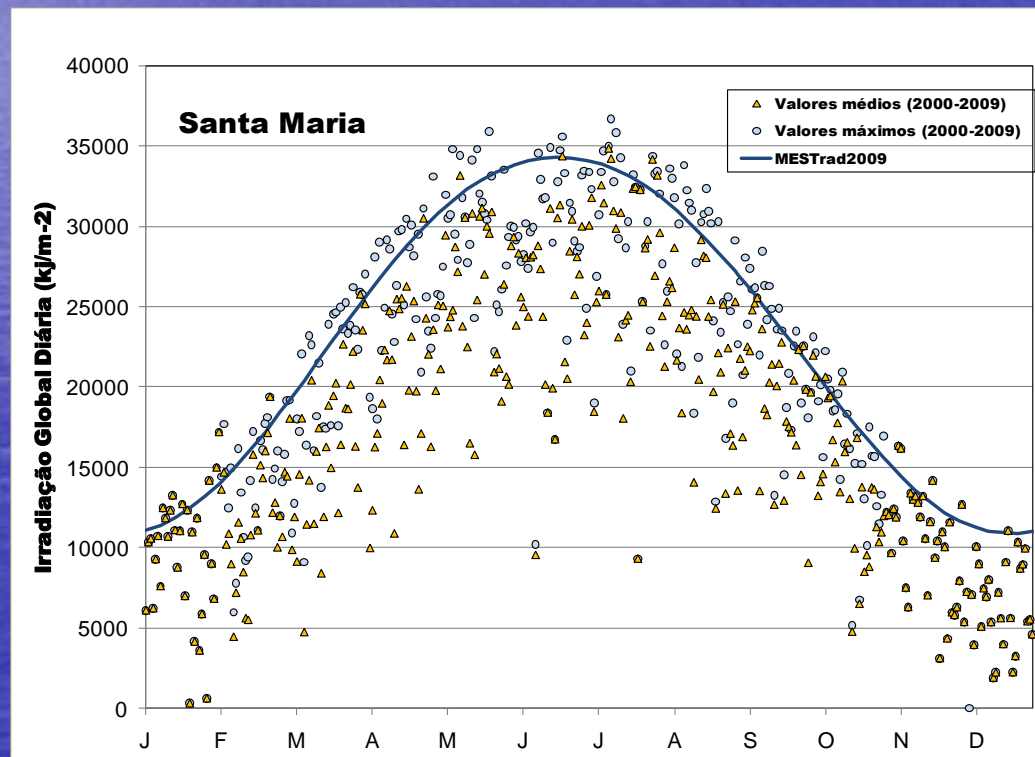
Year range: 1999 - 2009

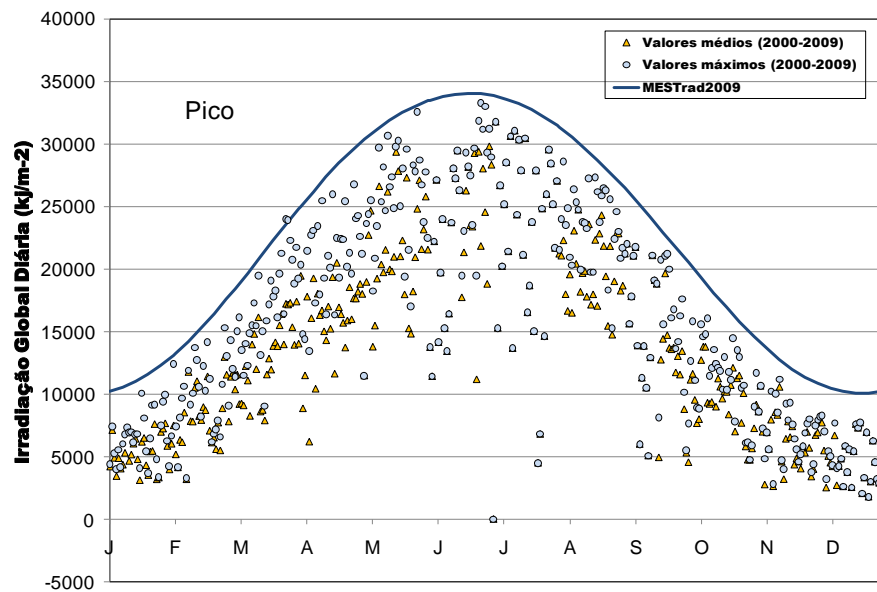
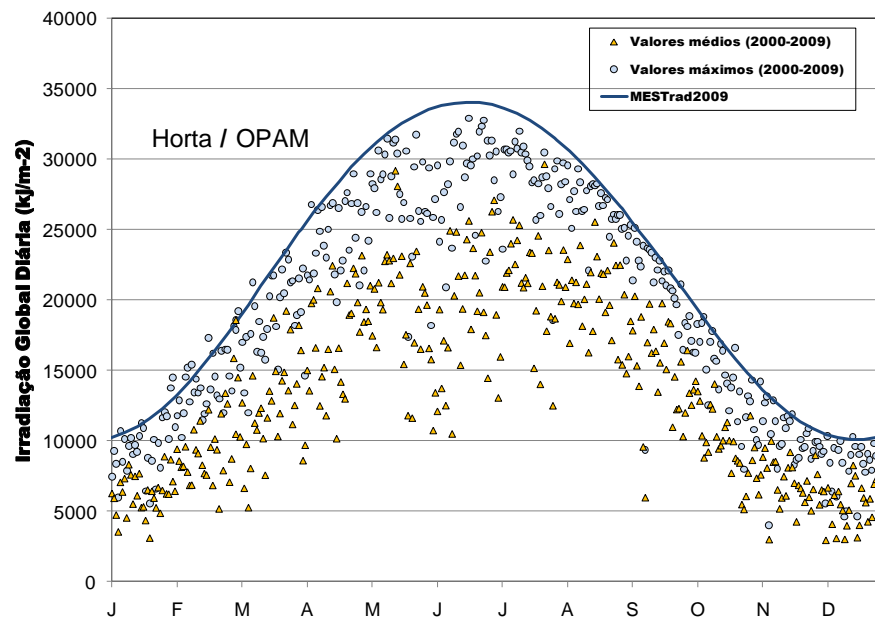
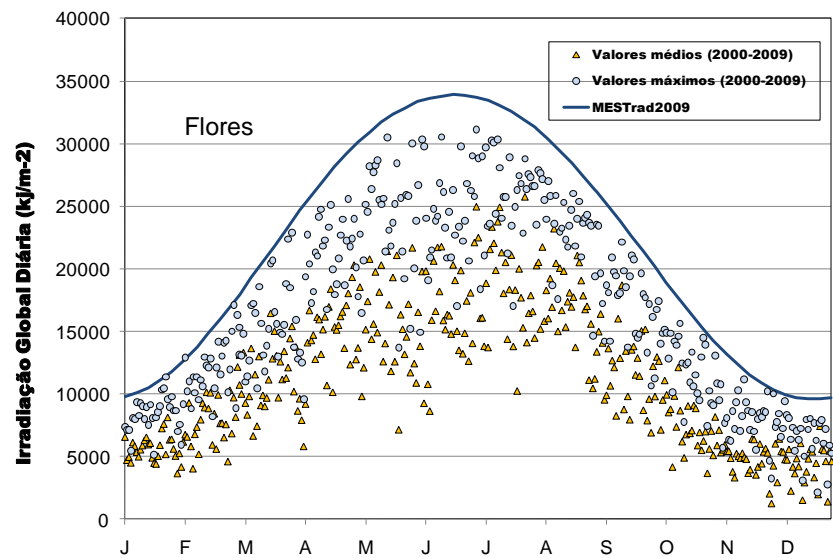
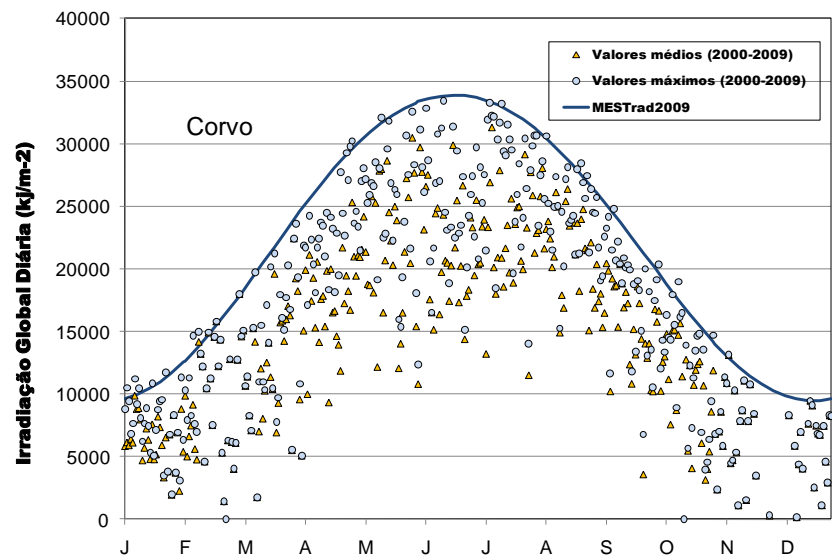
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1786.3	1906.1	3020.5	2860.5	3807.4	6717.3	6939.0	5956.2	4916.7	2976.5	2327.3	1698.6
	2040.7	3581.7	4259.3	3696.8	4941.5	7419.3	8648.6	7561.7	6542.2	3120.7	3627.5	2781.9
	1591.1	891.1	1493.9	1730.9	3134.1	5858.3	6143.9	4196.9	3637.6	2696.7	856.6	801.8
	5	5	4	4	4	3	4	6	4	3	5	4
02	1809.3	1845.2	2977.9	2355.5	5903.7	5073.5	6253.0	5496.7	4168.8	3607.4	1645.4	1682.4
	2301.2	2839.5	3637.4	3478.3	6486.4	7232.4	8007.9	7743.8	6514.1	4654.0	3018.5	2041.9
	1296.6	352.7	1393.1	602.3	4901.0	3546.6	3623.4	4022.1	2916.2	2770.1	331.2	1320.2
	5	3	4	4	3	3	4	5	3	4	3	4

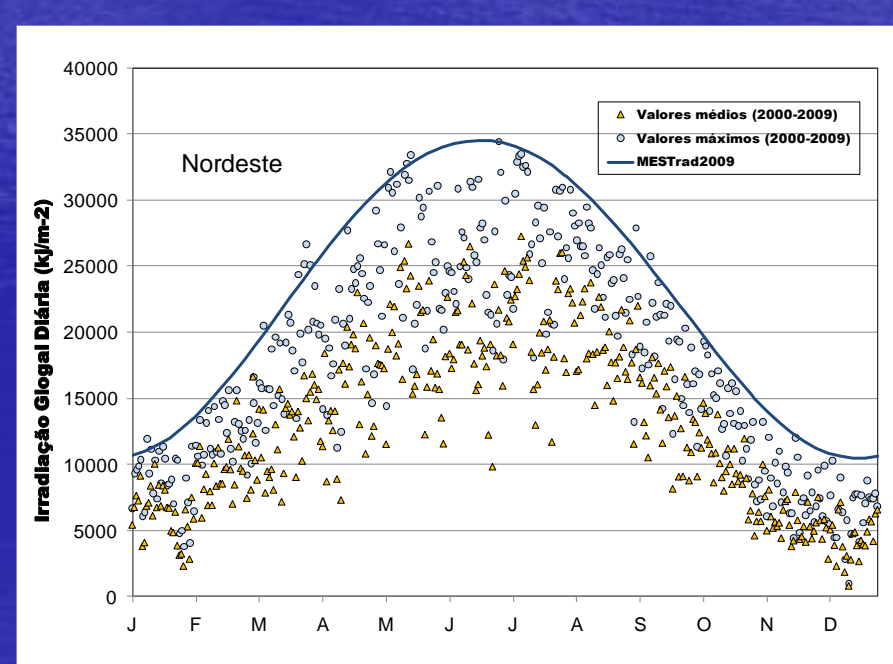
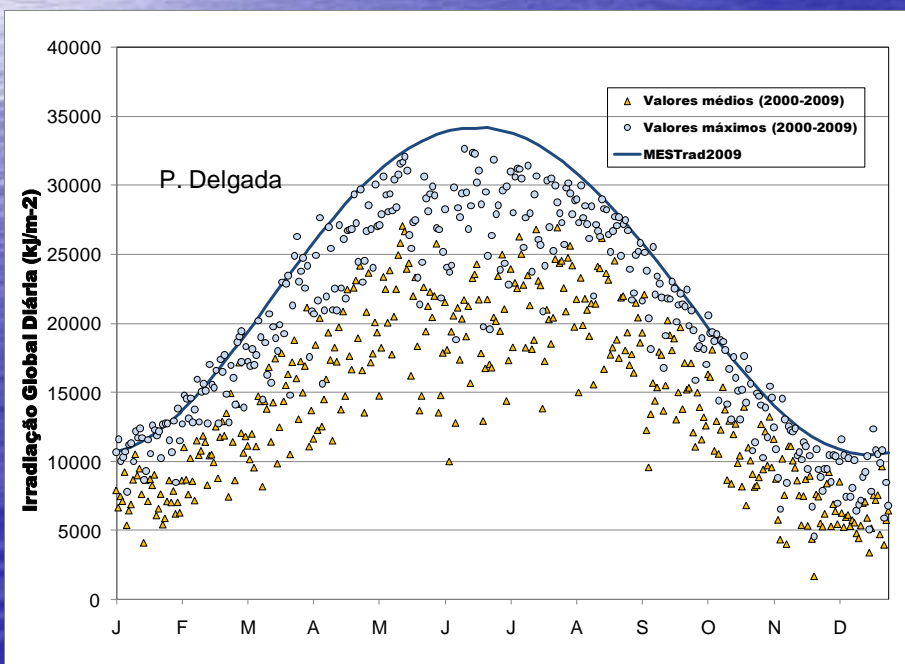
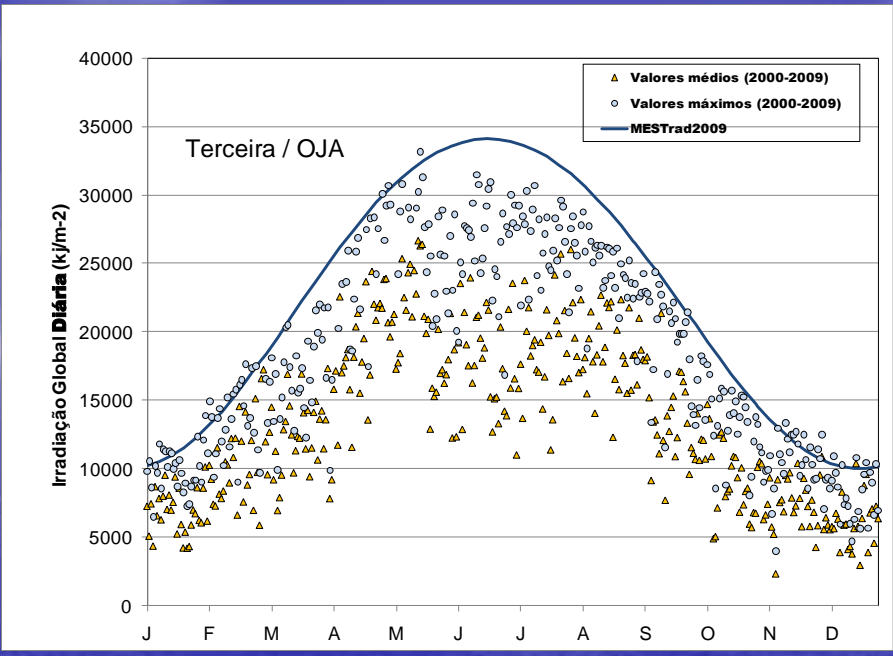
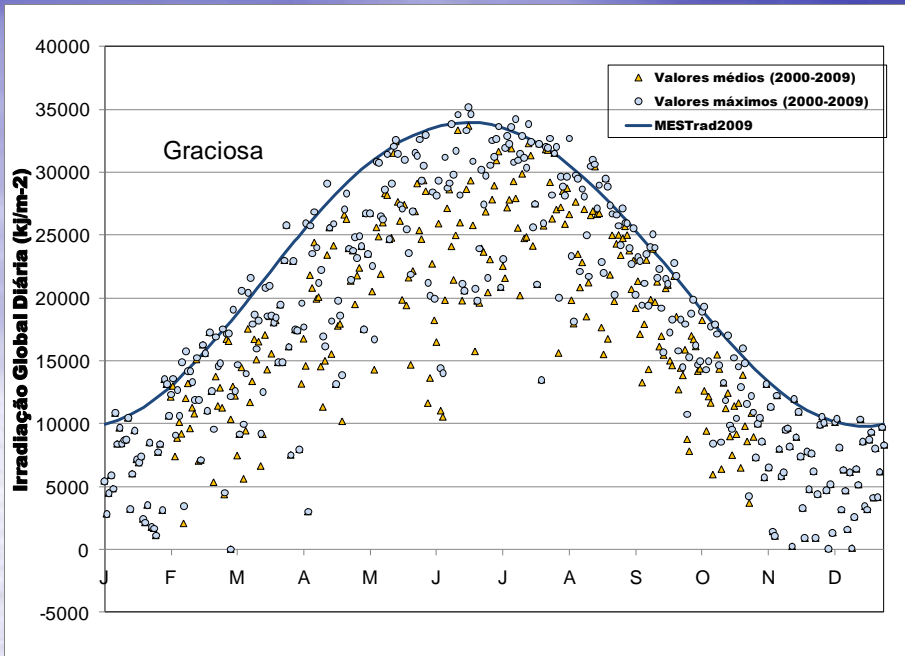
Resultados (II)

(1999-2000)

Irradiação global diária(kJ/m²)







Resultados (III)

(1999-2000)

Tabelas da Irradiação Global Mensal (Wh/m²)

Station: (085060) FAIAL ISL

Global Radiation G in WH.M-2 (WRR)

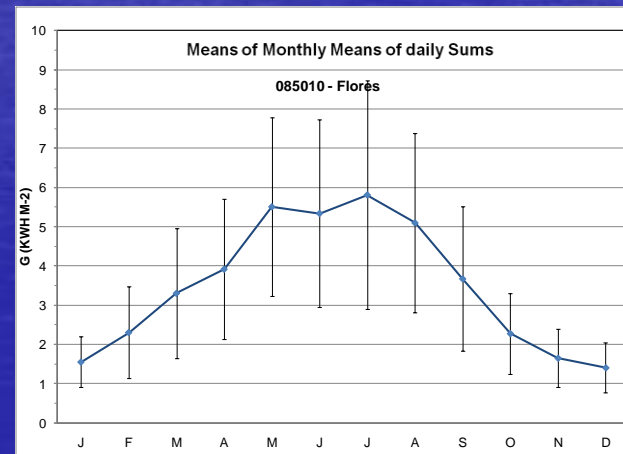
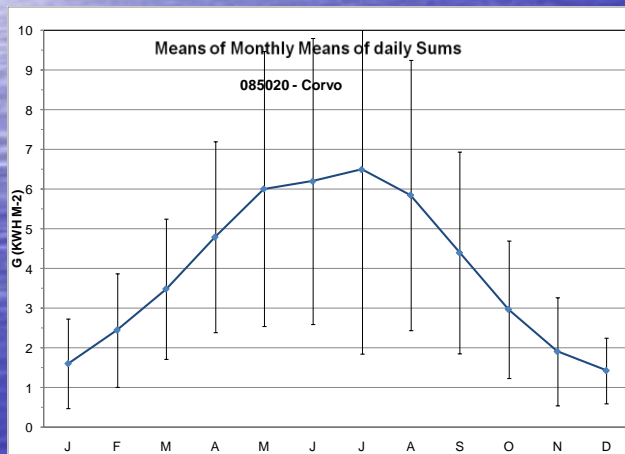
Latitude: 38 31 N Longitude: 28 38 W Altitude: 60 m

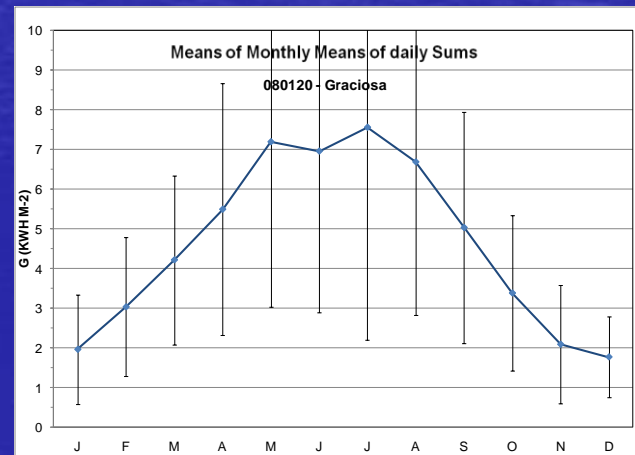
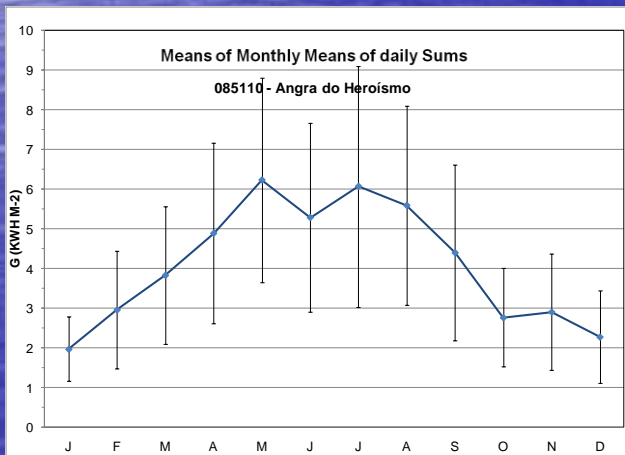
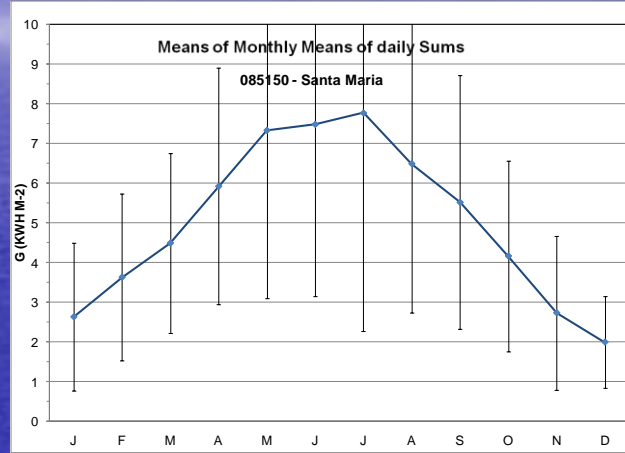
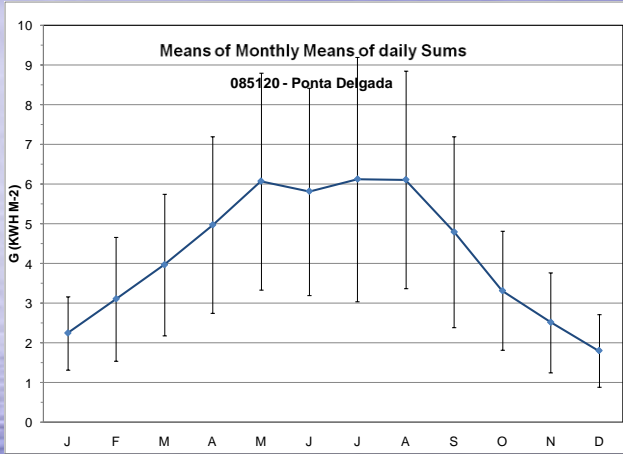
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
G	1865.1	2797.0	3712.3	4519.4	6434.5	5970.2	6437.0	6130.6	4618.6	3090.1	2277.1	1771.3
GSTD	769.6	1403.0	1669.4	2101.8	2644.0	2697.4	3224.0	2747.0	2314.7	1386.8	1021.8	794.0
GMAX	3508.2	4870.8	5865.4	6778.9	8290.6	9060.0	8627.1	8085.1	6756.0	5364.4	3619.5	2786.2
GMIN	450.3	913.0	913.2	1163.5	3792.9	2012.7	2987.6	3114.1	1744.9	692.0	890.7	549.5
N	7	5	6	6	7	6	5	6	5	6	6	6
G0	4585.0	5742.2	8058.3	9696.9	11148.0	11588.8	11192.8	10192.6	8657.8	6269.3	5092.5	4123.0
G/G0	0.407	0.487	0.461	0.466	0.577	0.515	0.575	0.601	0.533	0.493	0.447	0.430

Resultados (III)

(1999-2000)

Diagramas da variação média anual da irradiação global (kWh/m²)





Resultados (IV)

(1999-2000)

Número de dias com irradiação global média acima de certos limites (Wh/m²)

WH M-2	JAN	FEB	MAR	APR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DEC
0	31	28	31	30	31	30	31	31	30	31	30	31
200	31	28	31	30	31	30	31	31	30	31	30	31
400	31	28	31	30	31	30	31	31	30	31	30	31
600	31	28	31	30	31	30	31	31	30	31	30	31
800	31	28	31	30	31	30	31	31	30	31	30	31
1000	31	28	31	30	31	30	31	31	30	31	30	30
1200	31	28	31	30	31	30	31	31	30	31	30	29
1400	31	28	31	30	31	30	31	31	30	31	30	27
1600	30	28	31	30	31	30	31	31	30	31	28	24
1800	26	28	31	30	31	30	31	31	30	31	27	18
2000	23	27	31	30	31	30	31	31	30	31	25	13
2200	14	26	31	30	31	30	31	31	30	31	18	6
2400	9	24	31	30	31	30	31	31	30	27	17	2
2600	5	22	31	30	31	30	31	31	30	25	13	
2800	1	21	30	30	31	30	31	31	30	23	9	
3000		16	27	30	31	30	31	31	30	21	7	
3200		12	25	28	31	30	31	31	30	20	5	
3400		7	23	28	31	30	31	31	28	17	4	

OBRIGADA PELA
Atenção!