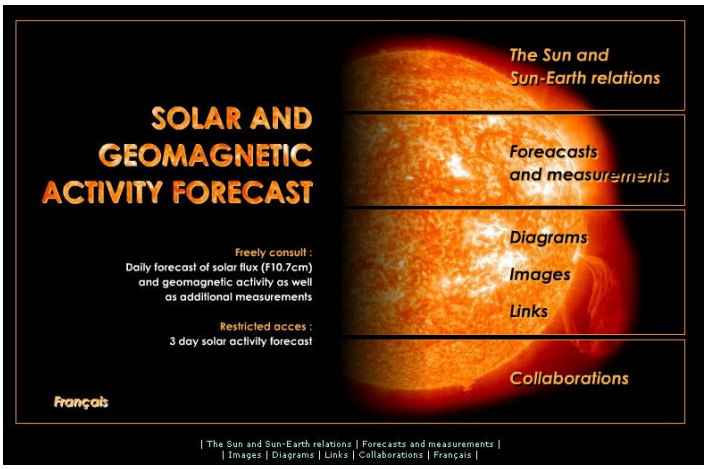
SFC – Solar and magnetic Forecast Center

J.J. Valette[1], P. Yaya[1], J. Toulemont[1], A. Segonds[1], G. Pontonnier[1], F. Bouille[1] ,L. Soudarin[1]
P. Lantos[2], E. Quemerais[3]

[1] Collecte Localisation Satellites, 31520 Ramonville St-Agne, France
[2] Observatoire de Paris-Meudon, 5 place Janssen, 92195 Meudon Cédex, France
[3] Service d'Aéronomie, CNRS , Verrières Le Buisson, France

ESA Pilot Project for Space Weather Applications

http://www.cls.fr/previsol/



ABSTRACT

SFC, the Solar Forecast Center mainly provides predictions of the F10.7 cm solar flux and of some magnetic indexes from 3 days up to 14 days (http://www.cls.fr/previsol/). It is part of the ESA Space Weather Pilot Project and SWENET as a Space Development Activity (SDA). The main initial dedicated applications of the service were to provide inputs for the modelling of the atmospheric drag effects on the low Earth orbit satellites. However, the prediction of magnetic storm gets more and more importance such as in the community of GNSS signal users for geodetic survey or navigation...

CLS which operates SFC still maintains close collaboration with scientific laboratories or the French Space Agency order to improve the prediction service performances and to extend the range of its applications. A recent algorithm of the Service d'Aéronomie of Verrières le Buisson and the Observatoire de Paris-Meudon processes the Swan/SOHO data of the Sun far side to establish 14 days forecasts. The Institut d'Astrophysique Spatiale de Paris will study 3D structures of the solar corona with the near future STEREO/NASA images, the two probes are to be launched in spring 2006. Another example is the Laboratoire de Physique de l'école Polytechnique which focuses on a magneto-hydro-dynamic model to predict the solar flares and CMEs.

FORECAST BULLETIN (public)

100 % availability (over last 5 yrs) and 98% on time user delivery at 14h UT

Data are updated every day at 14:00 UTC.

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        SOLAR BULLETIN 09/11/2005 1320UT

FORECAST
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FLARES      9/2 : Eruptive (C-classe flares expected, probability >50%)
MAGNETISM   9/2 : Quiet (AP LESS THAN 20)
PROTONS     9/2 : Quiet

SOLAR INDICES FOR 08/11/2005
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SUNSPOT INDEX        : 27
10CM SOLAR FLUX      : 79
AK CHAMBON LA FORET  : 6
AK Wingst            : 4
ESTIMATED AP         : 2
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Solar and magnetic indexes (F10.7, Kp…) are used for air drag force calculation (DTM, MSIS models) in the computations of LEO satellites orbit. Ephemerides are predicted up to 14 days.

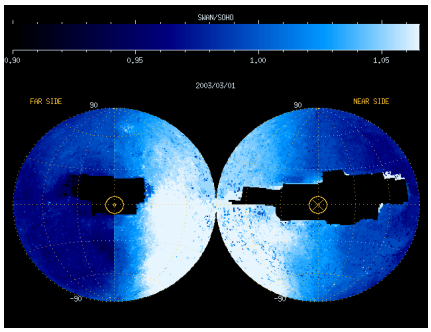
Main users are CLS (ARGOS system, NOAA satellites), CNES, GFZ (ERS)…

CLS forecast team is composed of 6 persons

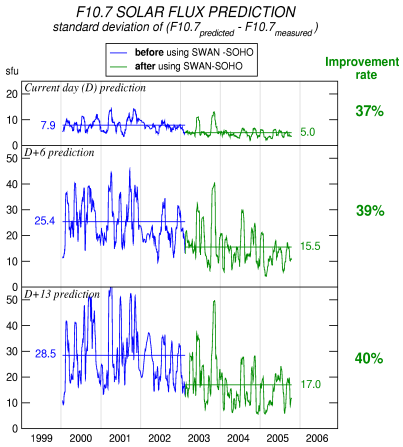
SWAN/SOHO [1,3]

SWAN instrument on SOHO provides Lyman-alpha (UV emission of H atoms) brightness of the back side of the sun illuminated by the active masked regions

SFC uses SWAN/SOHO since 2003 to help the monitoring of sunspot activity half a solar rotation in advance. The F10.7 prediction performance increased of 30% or more. MgII index predictions are even more improved.



SWAN instrument was built in co-operation between the French and Finish National Space Agencies : CNES and TEKES



SCIENTIFIC COLLABORATIONS FOR IMPROVEMENTS

- Service d'Aéronomie, CNRS : SWAN/SOHO ½ solar rev. forecast + Mg II
- Institut d'Astrophysique Spatiale, IAS/CNRS : Stereo mission for solar surface 3D structures evolution and CMEs prediction
- Centre de Physique Théorique de l'Ecole polytechnique, Paris : Solar magnetic field reconstruction and CMEs prediction [3-4]
- LEGOS/CNES, CETP, LPG/CNRS and Prague Univ. : thermospheric model improvements, new indexes (sectorial magnetic index, Mg II…)
- CNES : R & T

SOME REFERENCES

[1] E. Quemerais and J.L.Bertaux, 14-day forecast of solar indices using interplanetary Lyman alpha background data, in press.
[2] A. Blusson, E. Quemerais, SWAN Lyman Alpha data contribution for solar F10.7 flux, IAA, Vancouver, 2004.
[3] Amari, T, Luciani , J.F. , Mikic, Z. and Linker, J.: 2000 . Astrophys. Journal. 529, L49, "A twisted flux tube model for coronal mass ejections and two riboon flares twisted flux rope"
[4] Amari, T., Boulmezaoud, T. Z., Aly, J.J, D « Well Posed Reconstruction of the Solar Coronal Magnetic Field », 2005 Astronomy and Astrophysics, in press
[5] C. Lathuillere, M. Menvielle, WindII Thermospheric temperature perturbation for magnetically active situations, J. Geophys. Res., 109, 2004.
[6] C. Hanuise, J.C. Cerisier, F. Auchère, K. Bocchialini, S. Bruinsma, N. Cornilleau-Wehrlin, N. Jakowski, C. Lathuillère, M. Menvielle, J.J. Valette, N. Vilmer, J. Watermann, P. Yaya, From the Sun to the Earth: impact of the 27-28 May 2003 solar events on the magnetosphere, ionosphere and thermosphere, submitted to Annales Geophs, ESA Space Weather Week special issue, 2004.

CLS SERVICE SUPPLY

for any Space Weather operations 24h a day, 365 days a yr (backups, archives…)