Aurora Forecast 3D

A Global Adventure

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MATEMATICAL REPRESENTATIONS OF THE AURORAL OVALS

The Feldstein-Starkov ovals

Poleward and equatorward boundaries of auroral oval in geomagnetic co-latitude:

$$\theta_p \text{ or } \theta_e = A_0 + A_1 \cos\left[15\left(t+\alpha_1\right)\right] + A_2 \cos\left[15\left(2t+\alpha_2\right)\right] + A_3 \cos\left[15\left(3t+\alpha_3\right)\right],$$

where amplitudes A_i and phases α_i is given by

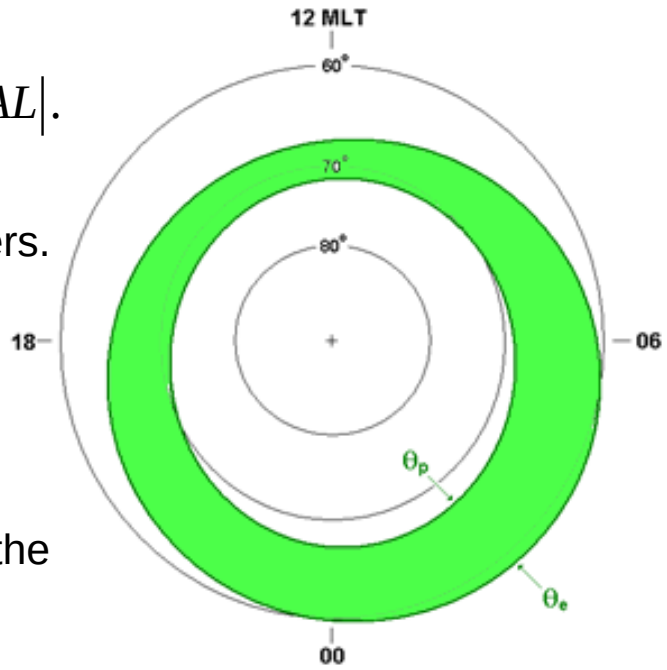
$$A_i \text{ or } \alpha_i = b_{0i} + b_{1i} \log_{10}\left|AL\right| + b_{2i} \log_{10}^2\left|AL\right| + b_{3i} \log_{10}^3\left|AL\right|.$$

The AL index is the max negative excursion of the H component from several ground based magnetometers.

It relates to the planetary Kp index by

$$AL = 18 - 12.3 \cdot K_p + 27.2 \cdot K_p^2 - 2 \cdot K_p^3$$

The Kp is the predicted +1 and +4 hours index from the Wing Kp model at NOAA-SWPC



THE KHO AURORAL OVAL FORECAST SERVICE (2012 – 2017)

Internet

PC/ SERVER

Client unis.no

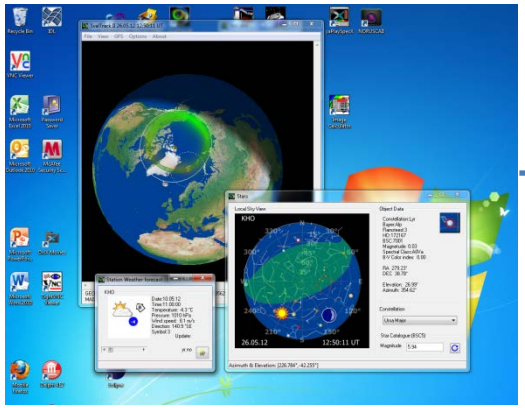
WEB

http://kho.unis.no

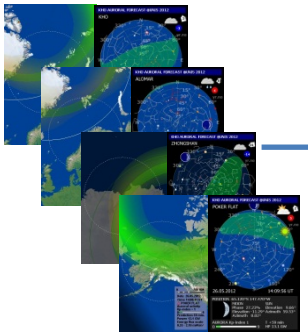
Kp index
NOAA-SWPC
(15 min. updates)

Weather forecasts
YR.NO (60 min.)

NEW: Aurora Forecast 3D



Stations x 007
(60 sec.)



+1 or +4 hours predictions

14 images

Mobile Auroral forecast applications (apps)

Limitations: Only a fixed number of stations available!

THE KHO AURORAL OVAL FORECAST 3D SERVICE (2017)

Internet

Kp index
NOAA-SWPC
(15 min. updates)

PC/
SERVER

Client unis.no

WEB

http://kho.unis.no

3 numbers

1 text line

Wing Kp time series

File

Kp index server

Wing Kp daily history +0, +1 and +4 hrs. 29.05.2017

Storm
Notifications

Current Kp
3
1.7
1.3

Kp Index

TIME [UT]

3 numbers

1 text line

The auroral forecast 3D

Aurora Forecast 3D - Snapshots

FEATURES

- 3D view port of Earth with zoom and rotation enabled.
- Solar illumination of the Earth and the Moon.
- Aurora oval size and location in real time. [1,2]
- Forecasts based on predicted NOAA-SWPC Kp index.
- Color scaled Kp speedometer.
- Aurora Compass sky view display.
- Editable station / location list.
- Go to animation.
- Right Ascension and Declination of planets. [3]
- Age of the Moon including the phase.
- Includes a 2.4 million star map. [4]
- City light texture. [5]
- Earth, Sun and Moon textures. [6,7]
- Skyview module to track planets and stars. [8]
- Geomagnetic storm alert notifications.

Downloads

Platform	Where	Link
Android Mobile	Google Play	Search for “Aurora forecast 3D”
Windows 32-bit PC	http://kho.unis.no	AuroraForecast3D_Win32.zip
Windows 64-bit PC	http://kho.unis.no	AuroraForecast32_Win64.zip
Apple OSX iMac	http://kho.unis.no	AuroraForecast32_OSX.zip
Apple iOS Mobile	Apple Store	Soon …

Acknowledgement

We wish to thank
The National Oceanic and Atmospheric Administration (NOAA) - Space Weather Prediction Centre for allowing us to download the predicted value of the K_p index every 15 minutes.

PS! The Aurora Forecast 3D is *fredware*….

References

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[8] Hoffleit, D. and Warren, Jr., W.H., The Bright Star Catalog, 5th Revised Edition (Preliminary Version), Astronomical Data Center, NSSDC/ADC, 1991.