



# Space Weather Activities in Ukraine Summer 2012 Report

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# In brief

- A new Space Research Programme was adopted by NASU
- Space weather (SWx) related missions launched in 2012:
  1. “Chibis-M” S/C was put into orbit on January 25
- Considerable progress in SWx modelling and forecasting was achieved
- 2 SWx meetings were concluded in Ukraine in 2012; at least 4 meetings are yet to be held

# SWx in Ukrainian Space Programmes

## State Space Programme (SSAU, 2013-2017):

- SWx-related missions (national and international)
- Research (limited) and international collaboration

## Academic Programmes (NASU):

- Individual SWx-related programmes:
  1. STP studies as a basis for SWx forecasting (2005-2007)
  2. GEO-UA (2008-2010)
  3. GEOSPACE (2011-2013, merged into SRP since 2012)
- Space Research Programme of NASU (2012-2016)

# Chibis-M (status report)

**Launch:** 2011-10-30 1011 UTC from Baikonur (TTMTR)  
2012-01-23 2209 UTC from ISS

**Designators:** SCN 38051, NSSDC ID 2011-062C  
(space-track.org data are partially incorrect)

**Orbit:** T = 94.48, 484x502 km, I = 51.64, RCS = 0.4109

**Launcher:** Soyuz-U/Progress M-13M via ISS (docked on Nov 2)

**Spacecraft:** Chibis, mass: 34.4 kg, Morse code telemetry in ham radio band 435.315 or 435.215 MHz, callsign PC-39 (Cyrillic RS)

**Designer:** Space Research Institute RAS (IKI), <http://cosmos.ru/>

**Current status:** In-orbit evaluation and instrument tuning

News releases (mostly in Russian) are available at the developers' website: <http://chibis.cosmos.ru/>

# Chibis-M (instrument suite)

Primary goal: investigation of thunderstorm emissions

Secondary goal: E/PO (ham radio community is the main focus)

Piggybacking: SWx monitoring (through MWC)

<b>Instrument</b>	<b>Specifications</b>
X-ray and gamma detector RGD	Energy range: 50-500 keV
UV detector DUF	Wavelength range: 300-450 nm
Digital camera DPC	Spatial resolution: 300 m Matrix dimensions: 500x500 px
Radio frequency analyzer RFA	Frequency band: 20-50 MHz
Magnetic & plasma suite MWC (Ukraine-Hungary collaboration)	$\varphi$ , B (vector), j (vector) Frequency range: 0.1-40000 Hz

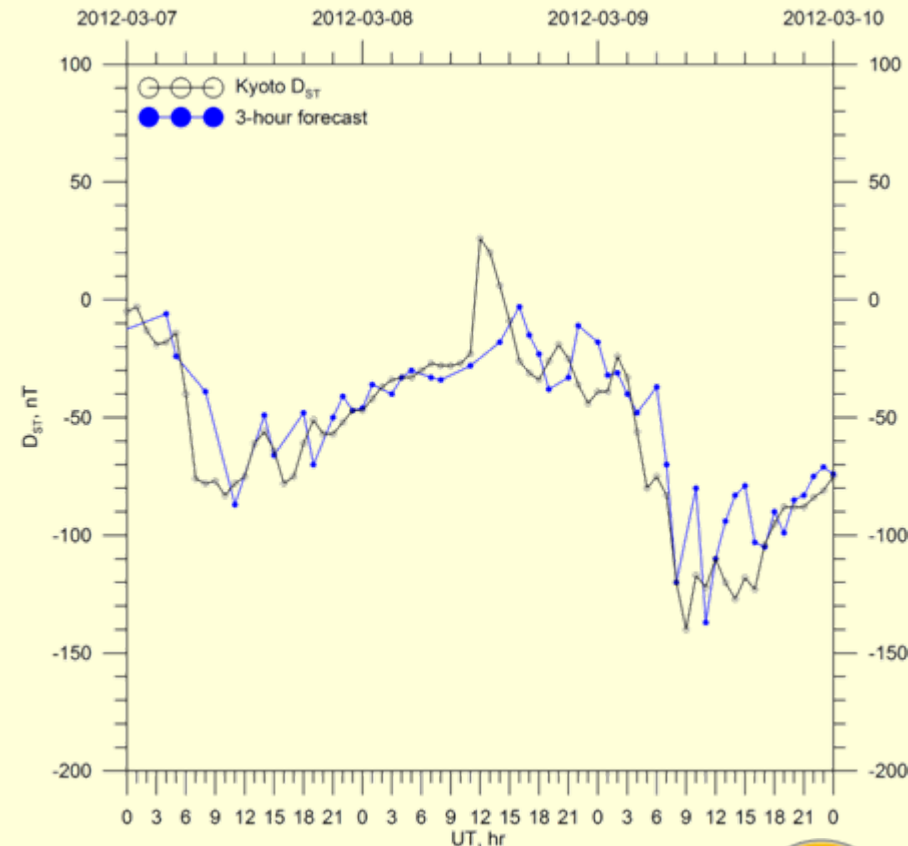
# Near-realtime validation of Dst forecast

Forecast: Dst, 3<sup>h</sup> lead time

Event: 7-9 March 2012

Synopsis: 3 X-class flares,  
at least 2 CMEs hit the  
Earth,  $B_z > 0$ , corrupt V data  
from ACE/SWEPAM due to  
an S3 radiation storm

More info: [arXiv:1203.1951]



The research leading to these results has received funding from the European Commission's Seventh Framework Programme (FP7/2007-2013) under the grant agreement n° 263506 (AFFECTS project, [www.affects-fp7.eu](http://www.affects-fp7.eu)).



# Central Europe Regional Ionospheric Model (CERIM)

CERIM describes diurnal variations of ionospheric parameters in the altitude range 200-750 km

CERIM consists of two parts:

- The empirical part is based on the data from Kharkiv ISR and ionospheric sounder “Bazis” during 1986-2006 (solar cycles 22-23). It allows calculating:
  1. electron density
  2. electron and ion temperatures
  3. vertical component of plasma drift velocity

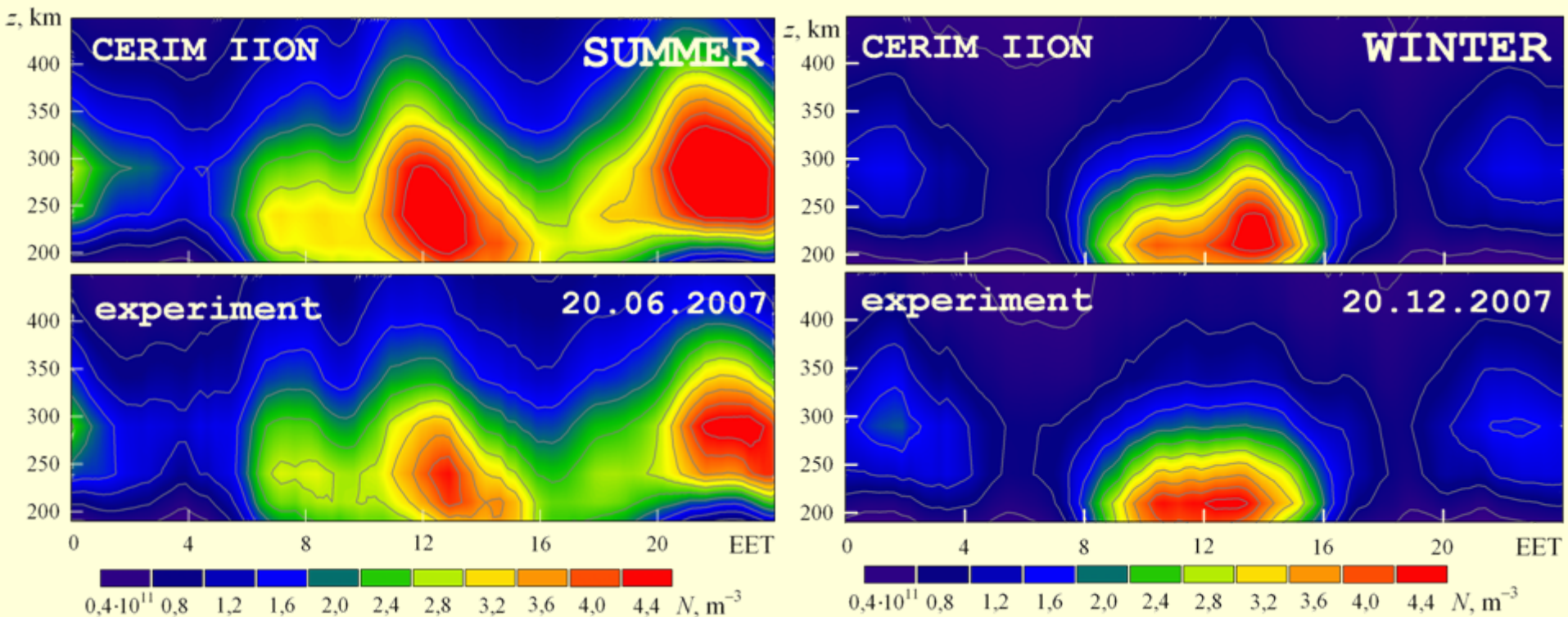
# Central Europe Regional Ionospheric Model (CERIM)

- The theoretical part describes:
  1. heat and particle flux densities
  2. energy input to electron gas
  3. thermospheric winds
  4. ion-electron and ion-neutral collision frequencies
  5. heat conductivity and ambipolar diffusion tensors
  6. plasma scale height
- The parameters of neutral atmosphere were calculated using the NRLMSISE-00 model



# Comparison of CERIM output with Kharkiv ISR data

Electron density,  $m^{-3}$  (Solar maximum)



# SWx meetings in Ukraine in 2012

- 19th Young Scientists' Conference on Astronomy and Space Physics, 23-28 April 2012, Kyiv National University
- Astronomy and Space Physics in Taras Shevchenko National University of Kyiv, 22-25 May 2012, Kyiv National University
- Physics of the Sun and Solar Cycle 24, 2-8 September 2012, Crimean Astrophysical Observatory, Nauchny, <http://solar.crao.crimea.ua/>
- 12<sup>th</sup> Ukrainian Conference on Space Research, 3-7 September 2012, National Space Centre, Yevpatoria, <http://space-conf.ikd.kiev.ua>
- External and internal sources of ULF waves in the terrestrial magnetosphere, 17-18 September 2012, Space Research Institute, Kyiv (by invitation only)
- General meeting of the Resonance project consortium (tentative title), 19-21 September 2012 (TBC), Space Research Institute, Kyiv

# Thank you for attention!



Space Research Institute of NASU & NSAU <http://www.ikd.kiev.ua/>

- Space Plasma Department <http://plasma.ikd.kiev.ua/>
- Laboratory for Satellite Near Space Exploration  
<http://nearspace.ikd.kiev.ua/>
- L'viv Center <http://www.isr.lviv.ua/>



Main Astronomical Observatory of NASU <http://mao.kiev.ua/>



Taras Shevchenko National University of Kyiv <http://univ.kiev.ua/>

- Astronomical Observatory <http://www.observ.univ.kiev.ua/>
- Chairs of Astronomy and Space Physics <http://space.univ.kiev.ua/>



Radioastronomical Institute of NASU <http://ri.kharkov.ua/>



V.N. Karazin Kharkiv National University <http://univer.kharkov.ua/>

- Space Research Sector <http://src.univer.kharkov.ua/>
- School of Radiophysics <http://www-radiophys.univer.kharkov.ua/>



Institute of the Ionosphere of NASU & MESYSU <http://www.ion.org.ua/>



Crimean Astrophysical Observatory of MESYSU <http://www.crao.crimea.ua/>

- Solar Physics Laboratory <http://solar.crao.crimea.ua/>



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