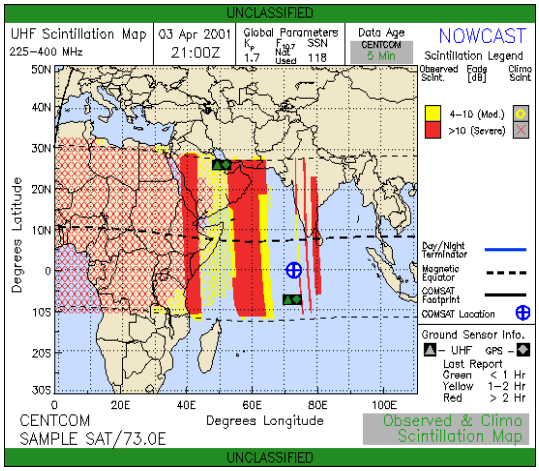
Scintillation Network Decision Aid, SCINDA

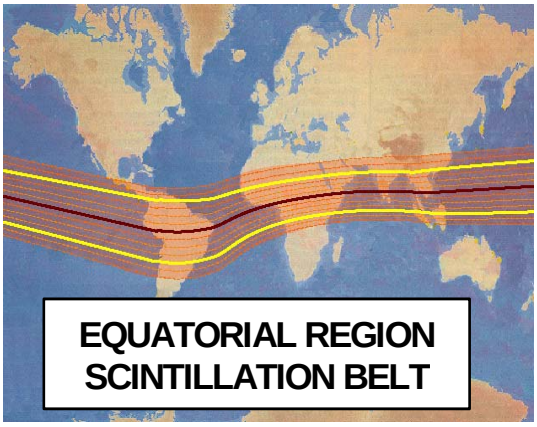
FACT SHEET Air Force Research Laboratory Space Vehicles Directorate 505.846.4704/4321 www.vs.afrl.af.mil

Developed for Air Force Space Command by the Air Force Research Laboratory's (AFRL's) Ionospheric Hazards Branch, the Scintillation Network Decision Aid is a computer program that predicts communication satellite outages in the equatorial region that are caused by naturally-occurring disruptions in the ionosphere.

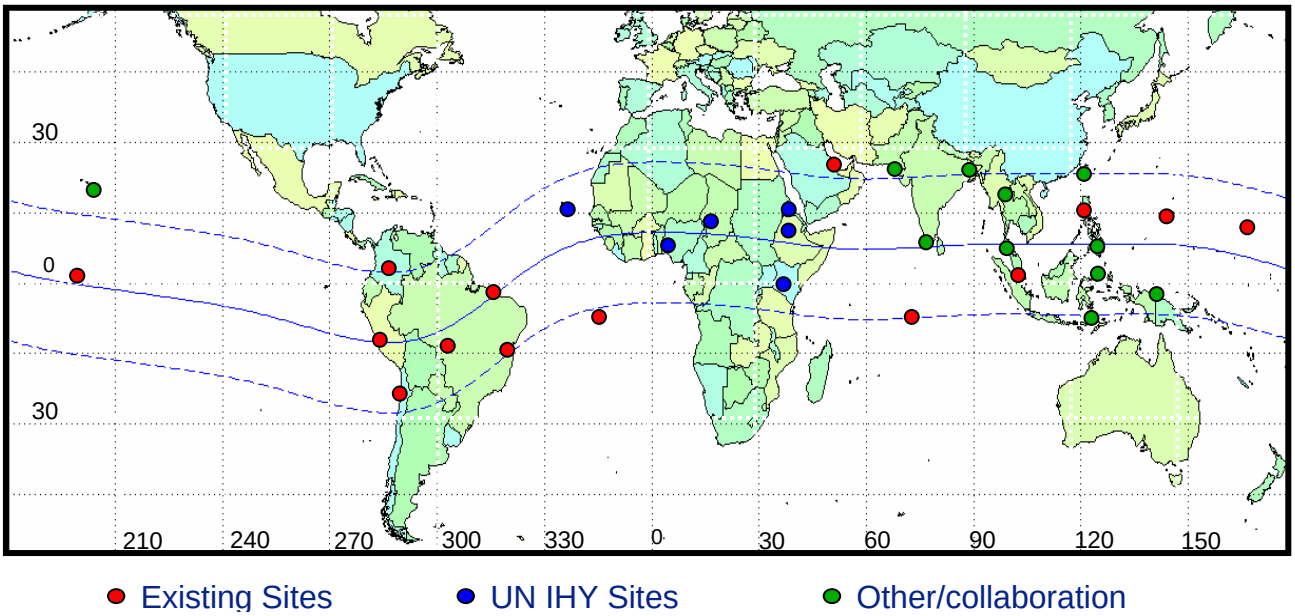
Ionospheric disturbances can mean rapid fluctuation or scintillation of satellite signals at or near the earth's surface. This phenomenon is most intense at night within 20 degrees of the earth's magnetic equator, which occupies more than one-third of the globe's surface. Affecting radio signals, scintillation seriously disrupts navigation and communication satellites. SCINDA was developed to advise operational users in real-time when and where scintillation is likely to occur.



SCINDA sensors are now installed at fourteen locations in South America, SouthWest Asia and SouthEast Asia (see map above). Scintillation data from available satellite links (GPS and geostationary beacons) and ionospheric drift velocities are measured and stored at the remote sites. At fifteen-minute intervals, this information is retrieved via the internet by AFRL researchers and compiled to make simple bi-color maps of disturbances over the equator and the corresponding areas of likely communication outages. A sample product two-dimensional map showing the projection of scintillation activity from a specified satellite over the CENTCOM theater of operations is shown below. Such



maps help scientists to better understand how scintillation structures develop and provide situational awareness to SATCOM operators. The solid color structures on the map depict areas where scintillation has actually been observed ("Warning Boxes") while the cross-hatch shaded areas indicate regions where scintillation is likely to occur ("Watch Boxes"). The red/yellow color scheme indicates scintillation severity in terms of nominal signal fade depths in dB as shown on the legend. A "real-time" map is produced every 15 minutes as well as a two-hour forecast map that is generated by propagating current conditions ahead in time with the SCINDA model. Maps may be customized by request to AFWA for specific regions, fade levels, etc. Products are posted on a web page hosted on a secure network (contact AFWA Operations Center, DSN 271-2586, afwaops@afwa.af.mil; or Keith Groves for more information).



The network is expanding geographically and 4-6 more stations throughout the equatorial region are expected during the next 18 months, particularly in Africa where AFRL has been participating in a United Nations Basic Space Science Initiative to deploy space weather sensors for the International Heliophysical Year (IHY). These stations will provide additional real-time data supporting scientific research on equatorial ionospheric disturbances and enhanced situational awareness to satellite communications users around the globe.

Current as of March 2006