

Problem Set for Terrestrial Radio Techniques Lecture

An Exercise in Using SuperDARN Data

A major geomagnetic storm ($K=8$) occurred on St. Patrick's Day 2015. Aurora was visible down all the way in southern Virginia! This exercise will help to get make you familiar with accessing SuperDARN to study this event. All figures required in this problem set can be generated using <http://vt.superdarn.org>.

1. Use vt.superdarn.org to generate a Daily GeoActivity Plot for 17 March 2015. Copy the GeoActivity plot into your homework report.
 - a. Geomagnetic storms have three phases: initial, main and recovery and can be identified by the Sym-H or Dst parameters. The initial phase is typically marked by a Sudden Storm Commencement (SSC). About what time did the SSC start? What is the physical significance of the SSC?
 - b. About what time was the ring current the strongest (storm main phase maximum)?
 - c. SuperDARN can only make measurements when irregularities are present in the ionosphere. About what did the SuperDARN radars make the most vector measurements?
 - d. The polar cap potential (Φ_{PC}) is a measure of magnetospheric convection. What time is there a sudden increase in magnetospheric convection? What phase of the storm did this occur in?
2. Use the Quick Browse Convection Map Plotter to generate maps of both Northern and Southern hemispheres just before and after the time that Φ_{PC} increased. Copy your convection map plot into your homework report.
 - a. Describe the differences you observe before and after the Φ_{PC} increase.
 - b. Describe the differences you observe between the Northern and Southern Hemisphere.
3. You want to do a coordinated study using individual SuperDARN radars and instrumentation at the MIT Haystack Observatory at Millstone Hill. Use the Radar Finder to identify the radars and beams that look over Millstone Hill. Copy the map into your homework report.
 - a. What radars, beams, and ground ranges look over Millstone Hill?
4. Use the Quick Browse Range-Time Plots to generate RTI plots for one of the radars and beams that you found in question 3.
 - a. Does the data look more useful before or after 12 UT?
 - b. Do you think any of the other radars or beams would be useful when doing a coordinated analysis with the Millstone Hill ISR?