Plotting Realistic Instantaneous Field of View Ellipsoids on an Arbitrary Earth Projection

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Abstract

A method is presented to calculate the earth coordinates of an elliptical shape that approximates the intersection of a spherical field of view with the earth's surface.

Uses:

Co-locating high resolution imagers with low resolution sounders for cloud detection.

Determining surface types for infrared and microwave emissivity computation.

etc

Assumptions:

- The earth is a sphere
- Neglect topography
- The field of view can be represented by an ellipse
- The satellite attitude is nominal
- The satellite height and sub point are known
- The centers of the individual fields of view are known

Next:

A lot of plane and spherical trigonometry is not presented here.

Result:

For each field of view a polygon of arbitrary size is constructed in earth coordinates that approximates the field of view.

This polygon can be passed to a drawing program (such as IDL of PGPLOT) for plotting purposes, or used in a geographical data base.

To Do:

1) Fix Kludge* around poles which correctly rotates ellipses in the opposite hemisphere of the sub point

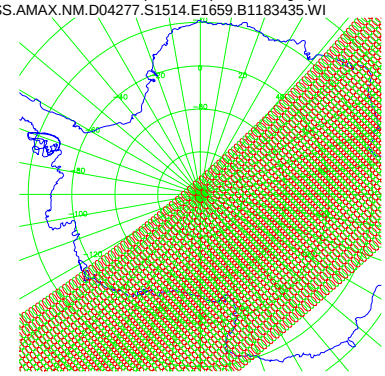
2) Fix a problem with ellipse when a pole is within the fov

3) Draw the fov as realistic ovoid

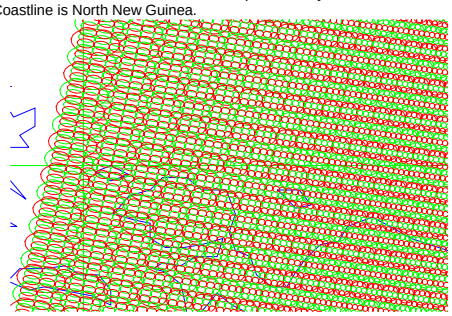
4) Finalize Fortran90 and IDL code

*A **kludge** (or **kluge**) is a 'solution' for accomplishing a task, originally a mechanical one and usually an engineering one, which consists of various otherwise unrelated parts and mechanisms, cobbled together in an untidy or downright messy manner. A kludge is never elegant except ironically, nor, serviceability to the task at hand excepted, is it ever admirable. Despite this, it generally takes a skilled craftsman, someone intimately familiar with the requirements of the desired task, the properties of the raw material at hand, and the ultimate operating environment, to produce a workaround monstrously clunky enough to be called a kludge. http://en.wikipedia.org/wiki/Kludge

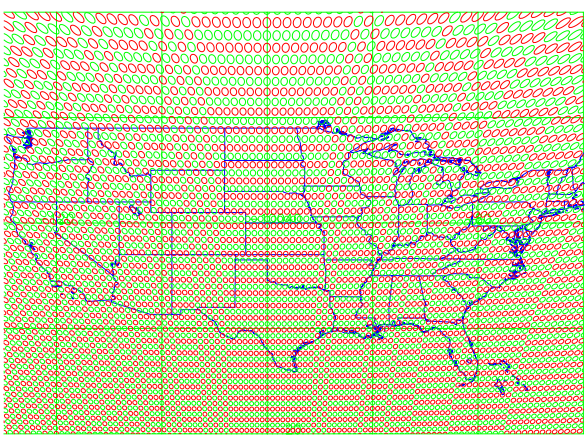
NOAA 16 AMSU-A scan pattern in polar stereographic coordinates.
NSS.AMAX.NM.D04277.S1514.E1659.B1183435.WI



NOAA-17 AMSU-A and AMSU-B scan pattern in cylindrical coordinates.
Coastline is North New Guinea.



Simulated GOES microwave sounder @ 100West with 40km nadir FOV



NOAA17 HIRS fields of view in polar stereographic projection. Note scan asymmetry.