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National Oceanic and Atmospheric Administration
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National Centers for Environmental Prediction
5200 Auth Road Room 207
Camp Springs, MD 20746

Technical Note

KML Demonstrations for MMAB[†].

Robert Grumbine [‡]
Environmental Modeling Center
Marine Modeling and Analysis Branch

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KML is a markup language for geographic information, used, among others, by Google Earth. It was the latter which prompted the demonstrations to the branch. Though it is designed for geographic information, it does presume a particular earth model – the WGS 84[1].

Demonstrations here were derived from the Google Earth tutorials[2], and require Google Earth[3] to be installed on your system. The software is free and no special setup is required.

The three demonstration are for 'placemarks' (marking locations, such as ships or buoys), polygons (say the boundaries of a gale warning), and overlays (display maps which will replace the Google satellite view). One can be much more elaborate than the demonstrations here. The system is sufficiently easy to use that only an hour or two were required to make the demonstrations.

The samples may be copied as text files and viewed on your own system. They may be viewed on a web server running Apache (as Polar does) after the httpd.conf has been updated to include:

```
* AddType application/vnd.google-earth.kml+xml  .kml
* AddType application/vnd.google-earth.kmz       .kmz
```

All examples, their support files, and this document, are available as a tar file in http://polar.ncep.noaa.gov/mmab/papers/tn268/

The kml placemarks and polygons were later useful in developing *a posteriori* filters for the sea ice analysis products [Grumbine, 2008]. The placemarks were used by tagging a geographic location with grid space location and how often in the period of analysis the area had ice cover. This could easily be generalized to any other critical point phenomenon such as extreme waves, sea surface temperature changes, ... Polygons were used to construct boundaries that were inclusive of areas of analytical interest, such as the Sea of Japan and Okhotsk, while ensuring that the areas did not overlap and that bounding curves did not cross in to water areas.

1   Placemarks

A placemark includes a name and a location (point). One may also declare how to 'look at' the placemark (namely, where our space-borne vantage will be). A number of placemarks may be collected in to a 'folder', and a 'look at' vantage applied to all of them.

The placemark coordinates are a longitude, latitude, elevation, in that order, with the locations in decimal degrees, and elevation in meters.

The locations are simply places that I've lived or relatives have. In the 'LookAt', note that a 'heading' has been given. This rotates the image view such that the locations fall mostly along a straight line.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">

    <Folder>
      <name>Overview</name>
      <LookAt>
        <range>1200000</range>
        <longitude>-81.25</longitude>
        <latitude>41.0</latitude>
        <heading> +17.0</heading>
      </LookAt>

    <Placemark>
      <name>Amwell, Hunterdon, NJ</name>
      <Point>
        <coordinates>-74.7989,40.483,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Dongan Hills, New Amsterdam</name>
      <Point>
        <coordinates>-74.0965,40.588,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Griffith </name>
      <Point>
        <coordinates>-87.4287,41.5239,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>MD2</name>
      <Point>
        <coordinates>-76.8556,38.9823,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Park Forest</name>
```

```
      <Point>
        <coordinates>-87.6754,41.4893,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Schaefferstown, PA</name>
      <Point>
        <coordinates>-76.293,40.298,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Griffith </name>
      <Point>
        <coordinates>-87.4287,41.5239,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>MD2</name>
      <Point>
        <coordinates>-76.8556,38.9823,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Park Forest</name>
      <Point>
        <coordinates>-87.6754,41.4893,0</coordinates>
      </Point>
    </Placemark>

    <Placemark>
      <name>Schaefferstown, PA</name>
      <Point>
        <coordinates>-76.293,40.298,0</coordinates>
      </Point>
    </Placemark>

  </Folder>
</kml>
```

2 Polygon

This polygon places a box around the mid Atlantic Gulf Stream region. Many more points could be used to label the boundaries of interest.

Notice, too, that the placemarks from the prior example are still visible. Operations which don't erase other things (as overlay may do) leave the previous items on the map.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
  <Document>
    <name>Paths</name>
    <description>Examples of paths. Note that the tessellate tag is by default
      set to 0. If you want to create tessellated lines, they must be authored
      (or edited) directly in KML.</description>
    <Style id="yellowLineGreenPoly">
      <LineStyle>
        <color>7f00ffff</color>
        <width>4</width>
      </LineStyle>
      <PolyStyle>
        <color>7f00ff00</color>
      </PolyStyle>
    </Style>
    <Placemark>
      <name>Absolute Extruded</name>
      <description>Transparent green wall with yellow outlines</description>
      <styleUrl>#yellowLineGreenPoly</styleUrl>
      <LineString>
        <extrude>1</extrude>
        <tessellate>1</tessellate>
        <altitudeMode>absolute</altitudeMode>
        <coordinates>
          -75.255,36.0795,2357
          -70.255,36.0812,2357
          -65.255,36.083,2357
          -65.256,40.084,2357
          -70.258,40.085,2357
          -73.259,38.086,2357
          -75.259,36.086,2357
        </coordinates>
      </LineString>
    </Placemark>
```

```
    </Document>
</kml>
```

3   Overlay

The overlay requires an image file with known lat-long structure. For this demon-
stration, I used the global sea ice analysis at 0.5 degree resolution. One trait is
that the figure needed to be flipped in its x direction to map properly into Google
Earth.

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
  <Folder>
    <name>Ground Overlays</name>
    <description>Examples of ground overlays</description>
    <GroundOverlay>
      <name>Large-scale overlay on terrain</name>
      <description>Sea Ice cover 8 January 2008</description>
      <Icon>
        <href>http://polar.ncep.noaa.gov/tmp/flop.gif</href>
      </Icon>
      <LatLonBox>
        <north>90</north>
        <south>-90</south>
        <east>0</east>
        <west>360</west>
      </LatLonBox>
      <LookAt>
        <longitude>-170</longitude>
        <latitude> 68</latitude>
        <range>5000000</range>
        <altitude>500000</altitude>
        <altitudeMode>relativeToGround</altitudeMode>
      </LookAt>

    </GroundOverlay>
  </Folder>
</kml>
```

4   Sources

[1] http://code.google.com/apis/kml/documentation/kmlreference.html last accessed 13 May 2008

[2] http://code.google.com/apis/kml/documentation/kml_tut.html last accessed 13 May 2008

[3] http://earth.google.com/ last accessed 13 May 2008

Grumbine, R. W., *A posteriori* Filtering of Sea Ice Concentration Grids, MMAB Tech Note MMM, 2008.