

Test_Flight_20151109

November 9, 2015

In this notebook, we'll review the test flight of the ER-2 on 11/9/2015. This was a short, 2.5-hour flight off the CA coast. The ER-2 overflowed several buoys. Unfortunately, it was cloudy over most of them. Still, this was a very successful flight for us. First let's import all the needed modules and ingest and process the raw data.

```
In [40]: from __future__ import print_function
import numpy as np
import matplotlib.pyplot as plt
import os
import glob
import rawpyampr
import tempfile
import pyampr
from IPython.display import Image
%matplotlib inline

In [27]: import warnings
warnings.filterwarnings('ignore')

In [28]: datadir = './'
files = glob.glob(datadir + '*.dat')
print(files)
fname = os.path.basename(files[0])[:-4]

['./AMPR-20151109-184848.dat']

In [29]: payload = rawpyampr.ampr_payload.AMPR_Payload(files[0])
localfile = tempfile.NamedTemporaryFile()
payload.writeLevel1B(localfile.name)
L1B = rawpyampr.ampr_level1b.AMPR_QC(localfile.name)
localfile.close()
try:
    os.remove(fname+'.nc')
except:
    pass
L1B.writeLevel2B(fname+'.nc')
```

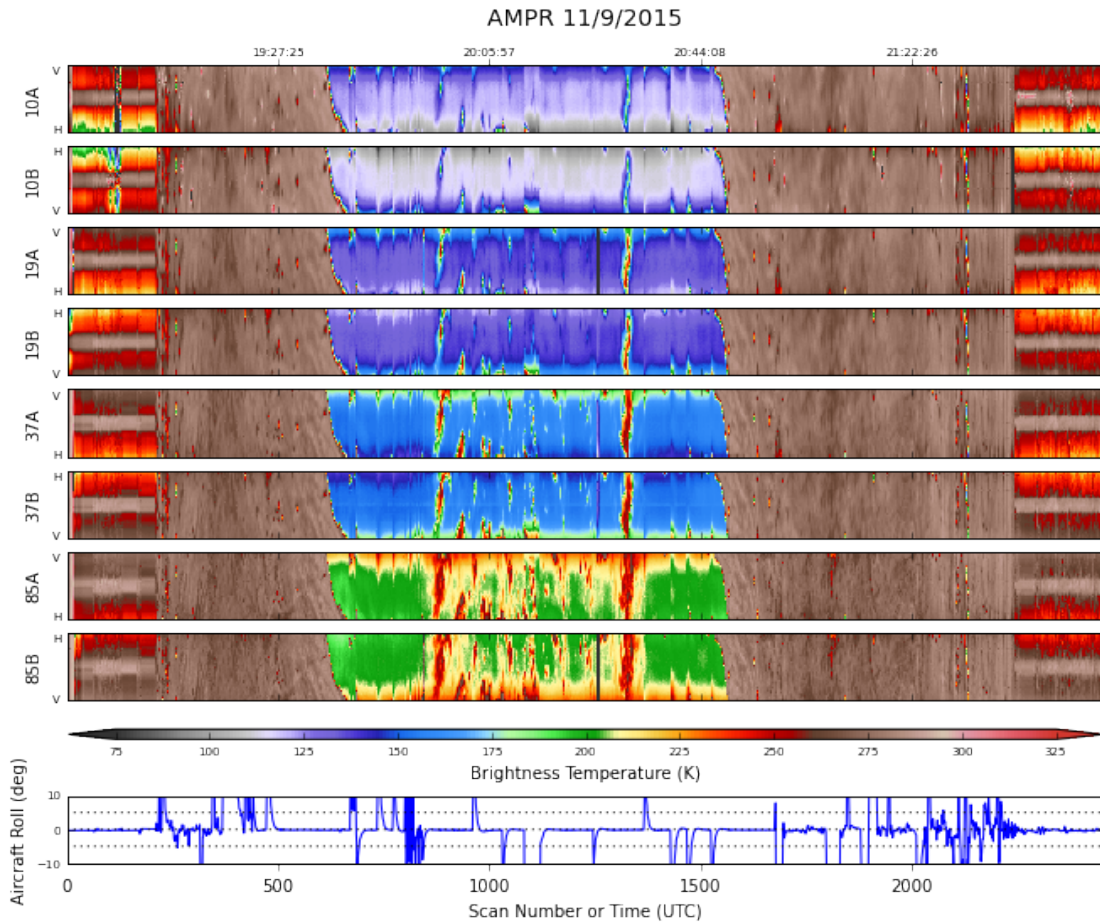
```
All of file: ./AMPR-20151109-184848.dat : Read Successfully
End of data stream reached
Interpreting Navigation Records as: IWG1
No navigation file found
Navigating pixels using internal recording of nav data.
Number points to converge: 4
Writing to output file: /var/folders/w/_vklk86yx0jb3nk7jqmwfmkbc0000gp/T/tmpyuwmt8m3
Found Navigation Data!
Writing to output file: AMPR-20151109-184848.nc
File containing water fraction not on path
```

Now we are ready to read in and display the L2 geolocated brightness temperatures.

```
In [30]: data = pyampr.AmprTb(fname+'.nc')
        data.plot_ampr_channels()
```

```
*****
read_ampr_tb_level2b(): Reading AMPR-20151109-184848.nc
Assuming IPHEX data structure.
Change to proper project if incorrect, otherwise errors will occur.
Currently available field projects: IPHEX, MC3E, TC4, TCSP, JAX90, COARE,
CAMEX1, CAMEX2, CAMEX3, CAMEX4, TRMMLBA, KWAJEX, TEFLUNA, FIRE3ACE, CAPE
Default: project = 'IPHEX'
Found Navigation Data!
(2448,)
*****
```

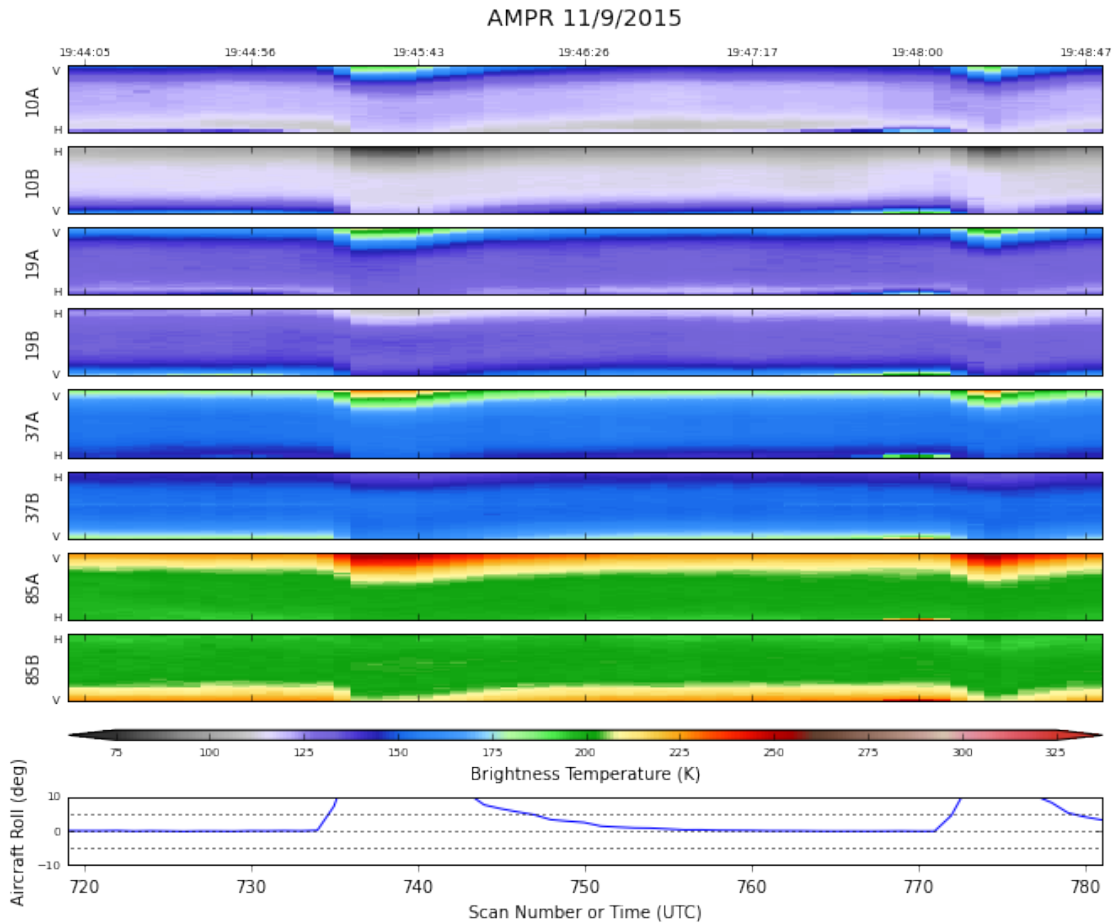
```
*****
plot_ampr_channels():
Available scans = 1 to 2448
Available times = 18:48:53 - 21:56:29
*****
```



Overall, the data look really good. Let's investigate a couple notable events. The first was when HIWRAP was cycled around 19:46 UTC. Based on our IPHEX experience, we had suspected that HIWRAP surface reflections from the clear ocean may be visible in our 37 GHz (B) channel. This is confirmed. Note the very subtle near nadir striping that goes away in 37B around the time HIWRAP is cycled.

```
In [31]: data.plot_ampr_channels(timerange=['19:44:00', '19:49:00'])
```

```
*****
plot_ampr_channels():
Available scans = 1 to 2448
Available times = 18:48:53 - 21:56:29
*****
```



Despite the nadir striping, its presence was actually very subtle and the two 37 GHz time series near nadir follow each other very well, with minimal offset. Perhaps the ocean surface was relatively rough and minimized the HIWRAP reflections. Not sure why we don't see similar reflections in A, since both A & B should have similar polarization states near nadir.

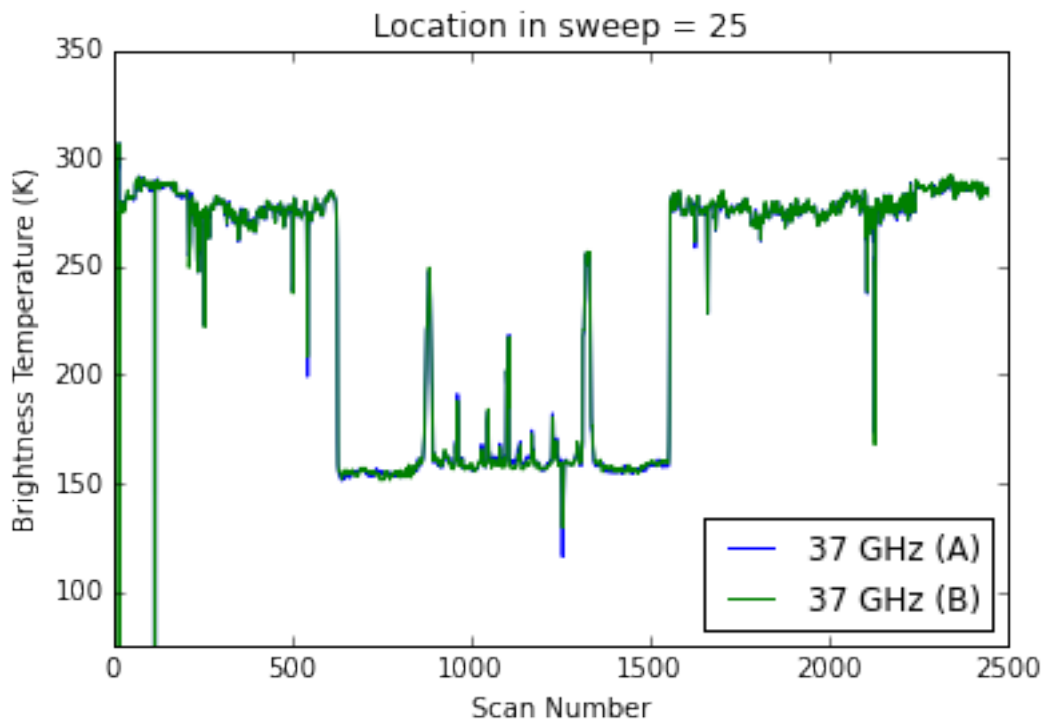
```
In [38]: chan = '37'
         ylim = [75, 350]
         index = 25
```

```

tsa = getattr(data, 'TB'+chan+'A')[:, index]
tsb = getattr(data, 'TB'+chan+'B')[:, index]
cond = tsa > -1000
plt.plot(np.arange(len(tsa))[cond], tsa[cond], label=chan+' GHz (A)')
plt.plot(np.arange(len(tsa))[cond], tsb[cond], label=chan+' GHz (B)')
plt.ylim(ylim)
plt.xlabel('Scan Number')
plt.ylabel('Brightness Temperature (K)')
plt.legend(loc='lower right')
plt.title('Location in sweep = '+str(index))

```

Out[38]: <matplotlib.text.Text at 0x12f7c1b38>



The ER-2 overflow a precipitation system off the coast near San Luis Obispo. Let's check that out next.

```

In [25]: stuff = data.plot_ampr_track('85a', timerange=['20:20:00', '20:40:00'],
                                     show_track=True, return_flag=True,
                                     meridians=0.5, parallels=0.5, resolution='h')
stuff[2].fillcontinents(color='#CCB299', lake_color='#CEE5F5', ax=stuff[1])
stuff[2].drawmapboundary(fill_color='#CEE5F5', ax=stuff[1])

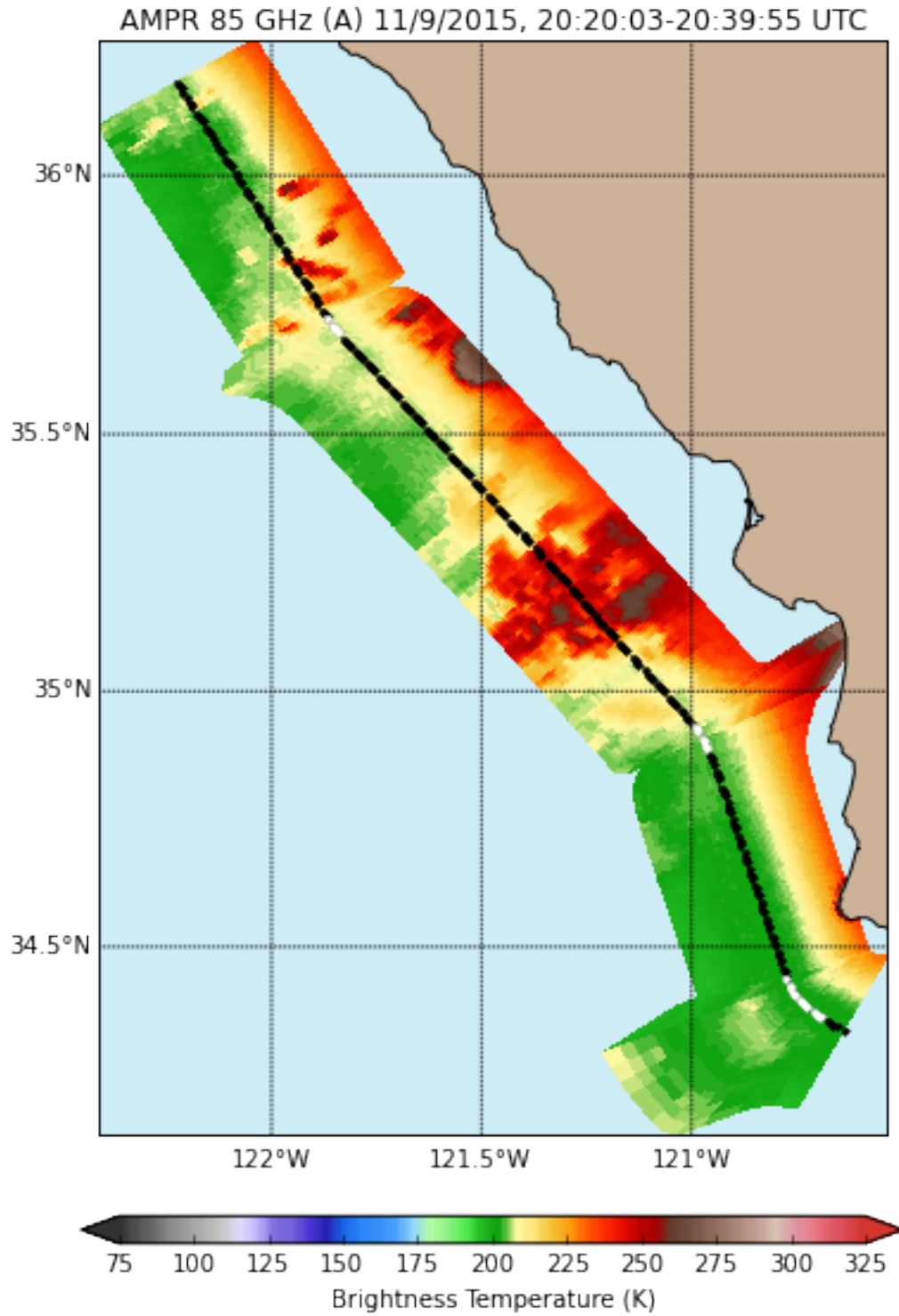
```

```

*****
plot_ampr_track():
Available scans = 1 to 2448
Available times = 18:48:53 - 21:56:29
*****

```

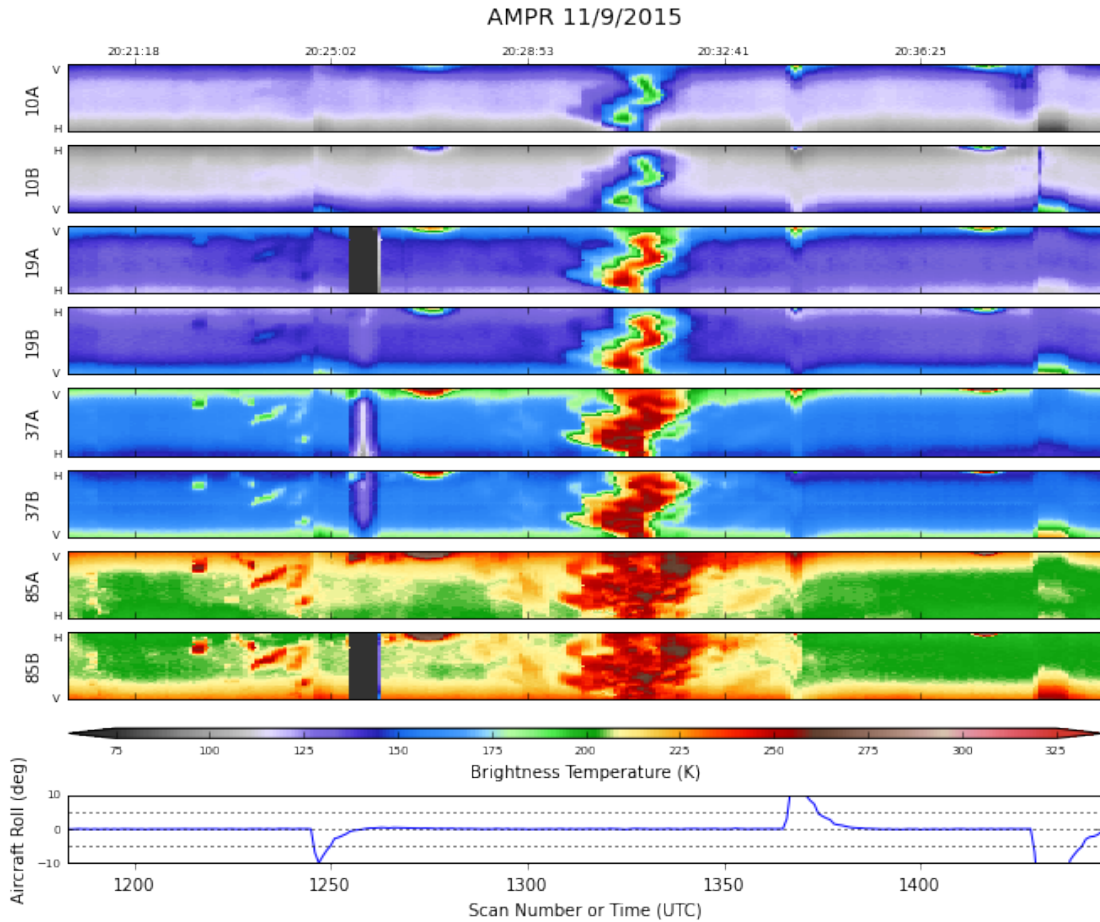
Out [25]: <matplotlib.patches.Rectangle at 0x10d4e38d0>



And below is the corresponding strip chart for this time period. Looks like we had some short-lived outages in a few channels. Not sure what's up with that, but it's the only hiccup I noticed in the data. The precip system had signal on all channels.

```
In [32]: data.plot_ampr_channels(timerange=['20:20:00', '20:40:00'])
```

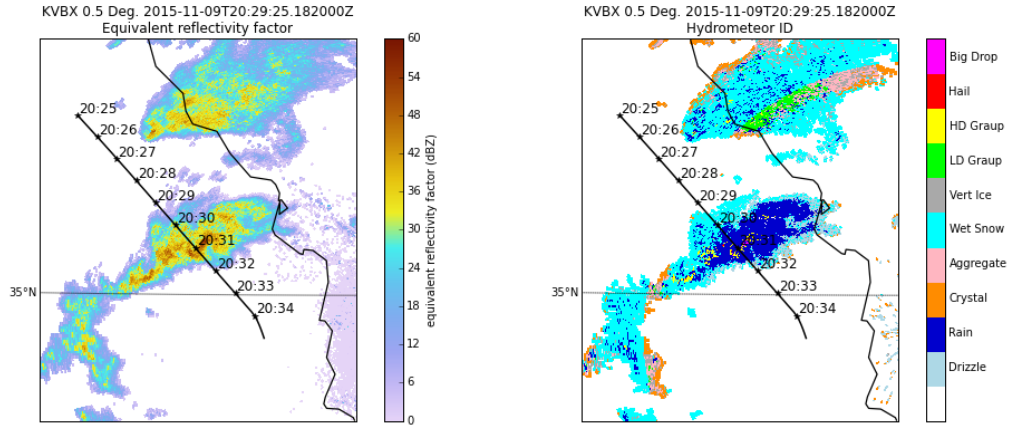
```
*****
plot_ampr_channels():
Available scans = 1 to 2448
Available times = 18:48:53 - 21:56:29
*****
```



Since I couldn't look at the AMPR data in real time, I got bored and started processing IWG1 nav and NEXRAD data. Here's what the echo looked like as the ER-2 flew over around 20:31 UTC, along with an attempt at hydrometeor ID based on the polarimetric NEXRAD inputs and a local sounding.

```
In [41]: Image('../NEXRAD/er2_example_20151109_2030z.png')
```

```
Out[41]:
```



I made that figure as the ER-2 was flying. It's like my own custom MTS! I have some fun ideas for spicing up my Flight Director reports when I serve in that capacity later this month.

In []:

In []:

In []: