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Sent: Thu, 02 Sep 2010 14:55:22  
To: FOIA0105@usgs.gov  
Subject: [Fwd: AVIRIS ocean oil flight line planning]

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Subject: AVIRIS ocean oil flight line planning

Date: Wed, 30 Jun 2010 10:07:11 -0600

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All,

With AVIRIS about to start flying in the Gulf, we need to be sure the oil data collects return good scientific data. From the many May flights, we our scientifically best flight was May 17. We had flights contaminated by clouds, haze and sun glint. We had flights on beautifully clear days with low wind and useless data for thick oil chemistry and volume estimates (may be good for other science) due to sun glint off of waves. AVIRIS performed perfectly and delivered high quality data on all these flights but weather, sun glint, wind and waves did not cooperate.

We learned a lot about the constraints we need for science data from the May

flights.

So these things must come together for good science data for oil chemistry, thickness, and volume:

- 1) cloud cover is minimal, including haze. No cirrus, even 1% cirrus impacts the data because the ocean is so dark.
- 2) AVIRIS must fly into or away from the sun azimuth direction to avoid sun glint.
- 3) High sun angle must be avoided so there is no sun glint. How high depends on the wave height and this is not completely modeled yet.
- 4) Low wave height and direction. The predominant wave trough/crest must be parallel to the sun azimuth direction for waves above a certain height (not well modeled yet). Probably a factor when the waves are greater than about 2 to 3 feet. Attached is a graphic that illustrates sun glint off of wave analogs by using test tubes in the lab. This means sun direction perpendicular to the AVIRIS flight direction. This can be relaxed to +/- 45 degrees or more as the wave height decreases (not well modeled yet).

#3 is simply scheduling, but impacts total flight hours. Peak sun height at Gulfport on July 5, 2010 is 82.4 degrees at local solar noon (within a couple of minutes of 1 pm CDT). The sun is 70 degrees elevation or lower from sunrise to 11:40 am and 14:20 to sunset CDT.

Below 30 degrees sun elevation, the atmospheric path increases too much with time and the data are poor. That leaves about 8:15 am to 11:40 am and 14:20 to 17:30 for quality data acquisition over oil in the ocean.

We can do coastal regions and calibration sites when the sun is high, but need to be on ocean sites when the sun reaches the optimum window period. That gives us about 3.5 hours of data collection over ocean in the morning or afternoon.

Depending on cloud buildup, we could fly morning or afternoon, if wave height and direction are compatible.

If all these things do not come together, the data are insufficient for adequate science regarding oil chemistry, thickness and volume.

Ira, you have the web sites for the buoys in the gulf. Would you please let us know the relevant ones we need to be watching? How about wind direction?

Have I missed anything?

The next question is when might the wave height and weather conditions be favorable for an ocean oil flight? I think we must take a "bird in the hand" approach and fly one set of lines before The July 5 ship deployment if the opportunity comes. But we still need the coincident flight when the ships are out sampling.

We need to figure out where the thick oil is now to help direct the ships and the sampling in the period July 5-10. After this storm, we don't know where the thick oil is.

We will fly the oil at 20,000 feet. What is the plane speed and how much time do we have?

Can we take off from New Orleans, get the calibration sites at Gulfport, Dauphin Island,

and Pensacola, then head into the oil region for 3.5 hours, then hit the bird's foot

calibration site (or Gulfport) on the way back to New Orleans?

We need to know the range and time limits on the Twin Otter flights.

Roger

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<http://www.usno.navy.mil/USNO/astronomical-applications/data-services/alt-az-us>

Sun or Moon Altitude/Azimuth Table: U.S. Cities and Towns

Astronomical Applications Dept.

U.S. Naval Observatory

Washington, DC 20392-5420

GULFPORT, MISSISSIPPI

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W 89 04, N30 23

Altitude and Azimuth of the Sun

Jul 5, 2010

Central Standard Time (ADD ONE HOUR for Daylight time)

Altitude Azimuth

(E of N)

h m	o	o
04:00	-11.8	54.5
04:10	-10.0	56.0
04:20	-8.2	57.4
04:30	-6.4	58.9
04:40	-4.5	60.2
04:50	-2.7	61.6
05:00	-0.1	62.9
05:10	1.5	64.1
05:20	3.4	65.3
05:30	5.3	66.5
05:40	7.2	67.7
05:50	9.2	68.9
06:00	11.2	70.0
06:10	13.2	71.1
06:20	15.3	72.2
06:30	17.3	73.3
06:40	19.4	74.4
06:50	21.4	75.4
07:00	23.5	76.5

07:10	25.6	77.5
07:20	27.7	78.5
07:30	29.8	79.6
07:40	32.0	80.6
07:50	34.1	81.7
08:00	36.2	82.7
08:10	38.4	83.8
08:20	40.5	84.9
08:30	42.7	86.0
08:40	44.8	87.1
08:50	47.0	88.3
09:00	49.1	89.5
09:10	51.3	90.8
09:20	53.4	92.2
09:30	55.6	93.6
09:40	57.7	95.1
09:50	59.9	96.7
10:00	62.0	98.5
10:10	64.1	100.5
10:20	66.3	102.7
10:30	68.3	105.2
10:40	70.4	108.1
10:50	72.4	111.5
11:00	74.4	115.7
11:10	76.3	120.9
11:20	78.1	127.5
11:30	79.7	136.1

11:40	81.1	147.3
11:50	82.0	161.7
12:00	82.4	178.4
12:10	82.1	195.4
12:20	81.3	210.3
12:30	80.0	222.1
12:40	78.4	231.1
12:50	76.6	238.0
13:00	74.8	243.4
13:10	72.8	247.8
13:20	70.8	251.3
13:30	68.7	254.3
13:40	66.6	256.9
13:50	64.5	259.1
14:00	62.4	261.1
14:10	60.3	262.9
14:20	58.1	264.6
14:30	56.0	266.1
14:40	53.8	267.6
14:50	51.7	268.9
15:00	49.5	270.2
15:10	47.3	271.4
15:20	45.2	272.6
15:30	43.0	273.8
15:40	40.9	274.9
15:50	38.7	276.0
16:00	36.6	277.0

16:10	34.5	278.1
16:20	32.3	279.2
16:30	30.2	280.2
16:40	28.1	281.2
16:50	26.0	282.3
17:00	23.9	283.3
17:10	21.8	284.4
17:20	19.7	285.4
17:30	17.7	286.5
17:40	15.6	287.6
17:50	13.6	288.6
18:00	11.5	289.8
18:10	9.5	290.9
18:20	7.5	292.0
18:30	5.6	293.2
18:40	3.7	294.4
18:50	1.8	295.6
19:00	0.1	296.9
19:10	-2.3	298.2
19:20	-4.2	299.5
19:30	-6.1	300.8
19:40	-7.9	302.2
19:50	-9.7	303.7
20:00	-11.5	305.2