1440568083-1713-16517-173-125
From: "Roger N. Clark" <rclark@usgs.gov>
Sent: Thu, 02 Sep 2010 14:44:51
To: FOIA0105@usgs.gov
Subject: [Fwd: Re: AVIRIS oil volume estimates]

-------- Original Message --------

Subject: Re: AVIRIS oil volume estimates

Date: Wed, 2 Jun 2010 10:10:23 -0600

From: Gregg A Swayze <gswayze@usgs.gov>

To: rclark@speclab.cr.usgs.gov

CC: elivo@usgs.gov, raymond@usgs.gov, thoefen@usgs.gov, gplumlee@usgs.gov, vlabson@usgs.gov, gmeeker@usgs.gov

References: <201006020805.o5285x5N025646@speclab1.cr.usgs.gov>

Hi Roger,

Sounds good to me. I do think the emulsions are in general thicker than 4mm. We had our meeting yesterday to help Mike Powers get the summary of the Mass Balance Team ready. What you describe below is for the AVIRIS Openfile. I like the way you've written it and think you should include it in the appropriate place in the text.

AVIRIS mapping looks great at this point except for a stubborn low oil category around 0.23 oil:water. Channel 216 seems unstable and I've had to move all the continua endpoints short of this channel. I need to relax the constraint on the 0.23 emulsion because fits are failing on the 2.3um band for that category. It is pretty clear that unmapped pixels (and there are a significant number of them) are not mapping into that category as they should based on inspection of their spectral shapes. Should be the last tweak to the Tetracorder command file.

False positives and negatives have been greatly reduced by raising the global fit to 0.7. Clouds and sun glint are no longer a problem.

I've managed with your help to get nearly all of the low level emulsion areal fractions mapped. Should make Ray and other co-authors happy that we are not leaving much unmapped. With the 0.93 oil:water fraction I made over the weekend by heating one of the emulsion samples at 110C to extract oil and drive off water, I filled in pixels for the highest oil area. Very frustrating not having all the endmembers needed when going into a mapping situation.

I've also found what looks like crude oil on the leading edges of the tear-drop shaped plumes. The spectra there have a relative high at 2.3um and relatively weak 1.3 and 1.5um peaks. Fits well with the Sunco sweet crude we have in the lab. The map pattern shows a very nice gradation from high oil to low oil in the down wind/current direction. Very consistent change in the spectrally derived oil:water ratio of the resulting emulsions. Should have access to DWH crude today at NWQ lab building. Probably better correlation between reference spectra and those mapped in the AVIRIS data based on using a higher fit threshold --- let the algorithm lead and identification will follow.

Hope to be running the final version of the command file on all of the data today.

Promises to be a very busy day,

Gregg

-----"Roger N. Clark" <rclark@speclab1.cr.usgs.gov> wrote: -----

To: elivo@usgs.gov, gswayze@usgs.gov, raymond@usgs.gov, thoefen@usgs.gov

From: "Roger N. Clark" <rclark@speclab1.cr.usgs.gov>

Date: 06/02/2010 02:05AM

cc: gmeeker@usgs.gov, gplumlee@usgs.gov, mhpowers@usgs.gov, rclark@usgs.gov, vlabson@usgs.gov

Subject: AVIRIS oil volume estimates

All,

We are considering adding into the AVIRIS paper a 3rd volume estimate category.

Let me know what you think.

Roger

The 3 are:

Near-infrared spectroscopy probes variable depth into oil: different depths at different wavelengths and different depths depending on the oil-to-water ratio. As the oil/water increases, the oil absorbs more light in a shorter path length. Thus, for oil/water greater than about 0.5, the organic absorption bands in the oil spectra become similar with only small changes. It becomes more difficult to determine the thickness of the oil in such high oil-to-water ratios, but still possible if the spectral calibration and signal-to-noise ratio is sufficient. Thus we derive 3 estimates for the amount of oil detected by the AVIRIS instrument.

Conservative: Oil thickness is capped to a low level where there

are greater differences in the spectral discrimination. The caps are dependent on the oil:water ratio and are given in Table 1.

Aggressive: Oil thickness is capped to the penetration depth of near-infrared light still showing spectral shape differences in laboratory spectra of oil collected from the Deepwater Horizon spill. This assumes that the AVIRIS data has the signal-to-noise ratio distinguish the thicker oil. Resulting AVIRIS maps show expected zonation of thick oil implying consistency with the lab data.

Possible: Field observations when oil was collected for this study showed oil thicknesses of 2 cm nad more. Near-infrared spectroscopy can not probe this deep, but if field observations are consistent with other areas of high oil:water ratio (>0.5) patches that are determined to be in the 1 to 2 mm range, those patches could be 20 to 30 mm and thicker. The possible category assumes 20 to 30 mm for those pixels. While this may still represent a lower limit, it is not known how representative such conditions were in the huge area of the spill, given only a day's access on May 7, and limited to no closer than 7 km from the source leak.

Table 1

Reference			Assigned thickness			Full pixel Volume
sp0484 ID#	Oil:Water	Thickness (mm)	Conservative (mm)	Aggressive (mm)	Possible (mm)	liters/pixel Conservative Aggressive Possible

9819	90:10	2.	0.5	0.5	30	
32.5	32.5	1950				
14464	80:20	10.	1.0	1.5	20	
57.8	86.7	1156				
13832	75:25	10.	1.5	1.5	20	
81.3	81.3	1084				
9820	60:40	0.025	0	0.025	0.025	
0	1.1	1.1				
3747	60:40	0.05	0	0.05	0.05	
0	2.2	2.2				
9816	60:40	0.1	0.1	0.1	0.1	
4.3	4.3	4.3				
3748	60:40	0.5	0.5	0.5	0.5	
21.7	21.7	21.7				
3749	60:40	1.85	1.5	1.9	1.9	
65.0	82.4	82.4				
3750	60:40	4.0	2	4	20	
86.7	173.4	867				
11257	40:60	0.025	0	0.025	0.025	
0	0.7	0.7				
11279	40:60	0.05	0	0.05	0.05	
0	1.4	1.4				
11283	40:60	0.1	0.1	0.1	0.1	
2.9	2.9	2.9				
11285	40:60	0.5	0.5	0.5	0.5	
14.5	14.5	14.5				

11288	40:60	1.85	1.5	1.9	1.9	
43.3	54.9	54.9				
11289	40:60	4.0	2	4	20	
57.8	115.6	578				
13689	23:77	0.025	0	0.025	0.025	
0	0.4	0.4				
13692	23:77	0.05	0	0.05	0.05	
0	0.8	0.8				
13695	23:77	0.1	0.1	0.1	0.1	
1.7	1.7	1.7				
13698	23:77	0.5	0.5	0.5	0.5	
8.3	8.3	8.3				
13699	23:77	1.85	1.5	1.9	1.9	
24.9	31.6	31.8				
13700	23:77	4.0	2	4	20	
33.2	66.5	332.5				
13703	foam	1.3:98.7	28	0	1	1
0	0.9	0.9				
13704		1.3:98.7	28	0	20	20
0	18.8	18.8				
14461		60:40+10Ben	6.0	0	0	-
-	-	-				
14462		60:40+18Ben	6.0	0	0	-
-	-	-				

Ben = benzene