

2421612097-46132-19055-185-203

From: Marcia K McNutt <mcnutt@usgs.gov>  
Sent: Wed, 4 Aug 2010 15:07:48  
To: GS FOIA 0105 <foia0105@usgs.gov>  
Subject: Fw: 1200 m CH4-oil-hydrate flow is NOT reproducible

\*\*\*\*\*

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----- Forwarded by Janet N Arneson/DO/USGS/DOI on 08/04/2010 03:07 PM -----

From: "wereley, Steven T." <wereley@purdue.edu>

To: ira leifer <ira.leifer@bubbleology.com>, Poojitha Yapa <pdya@clarkson.edu>, "pete@gso.uri.edu" <pete@gso.uri.edu>, Lori Caramanian <Lori\_Caramanian@ios.doi.gov>, Paul Bommer <pmbommer@mail.utexas.edu>, Peter Cornillon <pcornillon@me.com>, "savas@newton.berkeley.edu" <Savas@newton.berkeley.edu>, "Pedro I. Espina" <pedro.espina@nist.gov>, Bill Lehr <Bill.Lehr@noaa.gov>, Alberto Aliseda <aaliseda@u.washington.edu>, James J Riley <rileyj@u.washington.edu>, Juan Lasheras <lasheras@ucsd.edu>, Marcia K McNutt <mcnutt@usgs.gov>

2421612097-46132-19055-185-203

Date: 05/25/2010 10:28 AM

Subject: RE: 1200 m CH<sub>4</sub>-oil-hydrate flow is NOT reproducible

Ira, I'm not an petroleum guy but to summarize your position, you'd recommend stopping at computing a lower bound on the flow rate using PIV tracking of flow features. Someone can do an NSF proposal at a later date (not me by any means!) to determine how the speed of these outer turbulent structures relates to the flow rate of the plume.

Steve Wereley, Professor of Mechanical Engineering  
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West Lafayette, IN 47907  
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-----Original Message-----

From: ira leifer [mailto:[ira.leifer@bubbleology.com](mailto:ira.leifer@bubbleology.com)]  
Sent: Tuesday, May 25, 2010 10:10 AM  
To: Wereley, Steven T.; Poojitha Yapa; [pete@gso.uri.edu](mailto:pete@gso.uri.edu); Lori Caramanian;  
Paul Bommer; Peter Cornillon; [savas@newton.berkeley.edu](mailto:savas@newton.berkeley.edu); Pedro I. Espina;

Bill Lehr; Alberto Aliseda; James J Riley; Juan Lasheras; Marcia K McNutt  
Subject: Re: 1200 m CH4-oil-hydrate flow is NOT reproducible

Dear Colleagues.

I must disagree that we can refer to those scads of papers. There are not scads of papers appropriate for this flow situation. There are almost NONE.

It is simply impossible to re-create in the lab a bubble-hydrate-oil flow of comparable flow rate (these are not linear processes), with methane density of 1200 m depth!

Recall, methane is NOT air. At these depths, it is NOT an ideal gas.

This is NOT a trivial laboratory exercise, but rather a full blown science project for CFD folks (which I think should be supported at some point).

This is a lesson learned a decade ago and is why I have been making measurements in the field.

If a refined number is needed a field experiment becomes critical.

I think we need to be empirical, to be meaningful.

Ira

On May 25, 2010, at 6:57 AM, Wereley, Steven T. wrote:

> Frank, the way I see this is that we can come up with a lower bound  
> for the discharge rate of the oil based on the velocity of the outer

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> turbulent structures. Certainly that lower bound could be refined  
> by comparison with an CFD or laboratory-based PIV analysis of a  
> buoyant plume. We could probably do this correction pretty quickly  
> by comparing with someone's already existing buoyant plume paper. I  
> can't point our group to a particular paper, but there are scads of  
> them in this area...

>

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> -----Original Message-----

> From: Franklin Shaffer [mailto:Franklin.Shaffer@NETL.DOE.GOV]  
> Sent: Tuesday, May 25, 2010 9:53 AM  
> To: ira leifer; Wereley, Steven T.  
> Cc: Poojitha Yapa; pete@gso.uri.edu; Lori Caramanian; Paul Bommer;  
> Peter Cornillon; savas@newton.berkeley.edu; Pedro I. Espina;  
Bill.Lehr@noaa.gov  
> ; Alberto Aliseda; James J Riley; Juan Lasheras; Marcia K McNutt  
> Subject: RE: UPDATE

>

> We should keep in mind that this is not conventional PIV. We are  
> not tracking small particles that have been added to the flow field  
> and that follow the highest velocity gradients of the flow field.  
> From what I can see in the videos, we should be able to track  
> features in the jets at locations a few jet diameters downstream.  
> But we should be careful about what features we're tracking. What I

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> see at the outside of the jet are features that look like turbulent  
> eddies. These eddies may be moving at velocities much lower than  
> velocities inside the jet. What we really need to do is match these  
> features with CFD simulations of an oil/methane jet flow, then use  
> the CFD simulations to come up with a prediction of total leak rates.

> Frank

>

>>>> "Wereley, Steven T." <wereley@purdue.edu> 5/25/2010 9:29 AM >>>

> Let's go with 10 consecutive frames then. That was about the  
> minimum number I found to get solid measurements with the old low  
> resolution images.

>

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> From: ira leifer [mailto:ira.leifer@bubbleology.com]

> Sent: Tuesday, May 25, 2010 9:25 AM

> To: Wereley, Steven T.

> Cc: Peter Cornillon; Marcia K McNutt; Franklin Shaffer; Alberto  
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> Poojitha Yapa; Pedro I. Espina; pete@gso.uri.edu; Paul Bommer; James  
> J Riley; savas@newton.berkeley.edu

> Subject: Re: UPDATE

>

> Hi Steve,

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> I would recommend at least four frames as two would not allow errant  
> velocity vectors to be identified based on time sequence filtering.

>  
> -ira  
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>  
> On May 25, 2010, at 6:22 AM, Wereley, Steven T. wrote:  
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>  
> Peter, I like the browse edition idea. I would suggest this, 2-10  
> consecutive high resolution frames be pulled from the day long video  
> stream every minute. Then we could run a PIV analysis over a whole  
> day and plot the temporal fluctuation. The reason for the 2-10  
> frames is that 2 is the minimum for the PIV analysis and  
> considerably more is necessary to get a "nice" vector field.  
>  
> Of course, one thing that might make this impractical is that the  
> ROV may be repositioned during the run of this day long video.  
>  
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> From: [pcornillon@me.com](mailto:pcornillon@me.com)<<mailto:pcornillon@me.com>> [  
<mailto:pcornillon@gmail.com>  
> ] On Behalf Of Peter Cornillon  
> Sent: Tuesday, May 25, 2010 8:59 AM  
> To: Marcia K McNutt  
> Cc: Franklin Shaffer; Alberto Aliseda; [Bill.Lehr@noaa.gov](mailto:Bill.Lehr@noaa.gov)<  
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> >; Wereley, Steven T.

> Subject: Re: UPDATE

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> On May 25, 2010, at 8:49 AM, Marcia K McNutt wrote:

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>

> Couldn't agree more, Frank. And you are right. This isn't high tech  
> stuff. But the guys out on the oil platform who extracted the video  
> are a bunch of roughnecks and the expertise of the engineers here at  
> BP headquarters is in the area of hydraulics and heavy equipment.  
> They don't know what they are doing. Bill made exactly the right  
> call to grab all of the video so that you all can pick and choose  
> what you want and make the call on what you want to analyze. There  
> may be segments that aren't suitable for quantitative work but that  
> can at least tell you whether the parts you did select are  
> representative.

>

> In hindsight (which is always 20-20) a better way to approach this  
> would have been to have someone from the team come here to view all  
> of the files, bring in video editing equipment (since there isn't  
> any here), and do the selection for the team yourselves. Would have  
> been a lot faster. But this is second best, even though it caused  
> delays that are very tragic. Was this approach ever requested, out  
> of curiosity?

>

> Steve Weverley suggested this approach a few days ago, well, as I

> recall he actually suggested going to the platform where we thought  
> that the videos were stored.

>

> On a related issue, yesterday I suggested producing a browse version  
> of the entire video with the actual high resolution stream broken up  
> into manageable segments that one could readily locate from the  
> browse video and ftp from the archive. No one else commented on this  
> suggestion. I'm a bit concerned with the implication of your comment  
> above, Marcia, that one of us view the data stream and make a  
> selection. I have no problem with someone on the team going through  
> the entire sequence and suggesting a selection, but my guess is that  
> others will want to see the selections made in the context of the  
> available video.

>

> Peter

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>

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>

>

> Marcia

> \*\*\*\*\*

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> Date:

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> 05/25/2010 07:49 AM

>

> Subject:

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> Re: UPDATE

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> Martha and Team,

> I agree with the process Bill has chosen -- having the entire hard

> drives sent to him overnight. I just wanted to make two points.

> First that handling and editing this kind of video is not something

> new. We're not pushing the state-of-the-art. It's done all the

> time in the video industry. So it's just a matter of getting the

> right off-the-shelf equipment and expertise. I have been involved

> with some of the fastest high speed cameras that produce huge

> amounts of data, so I have an idea of what is available for data

> transfer and editing. The second point is that we need to have

> video samples long enough to account for flow rate variation. I'm

> new to the team, so perhaps this has been discussed already.

> But again, I agree that Bill is doing the right thing -- getting all

> of the video into our hands.

> Thanks,

> Frank

>

>>>> "Marcia K McNutt" <mcnutt@usgs.gov<mailto:mcnutt@usgs.gov>>

>>>> 5/24/2010 7:08 PM >>>

> Frank -

>

> All I can say is that the last time BP extracted a subset of the video

> from a larger file, the quality was not acceptable to this team

> because in

> the process the file was rewritten to lower resolution. So I told them

> thanks but no thanks. They don't know what they are doing. They

> offered to

> get professionals in to do it, but Bill decided he would rather be in

> charge. Good call.

>

> Marcia

> \*\*\*\*\*

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> Date:

> 05/24/2010 06:45 PM

> Subject:

> Re: UPDATE

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> How much does the flow rate of these leaks vary in magnitude and with  
> time? If the flow rate does not vary considerably, then we don't need  
> long excerpts of the video. We only need excerpts that are long  
> enough to  
> cover a few periods of the largest variations in flow rate.

>

> Someone from our team should be able to review a continuous, unedited  
> video over a length of time greater than the largest variations in the  
> leak rate. Then they can decide how long the excerpts we work with  
> need  
> to be. And they can pick out some excerpts that are of the best image  
> quality.

>

> I work with very large high speed videos all the time. If a camera is  
> generating a large video feed, then certainly off-the-shelf equipment  
> exists to review, edit, and extract excerpts of the large video  
> feed. 1600

> x 1200 at 25 frames per second is not something really unusual in the  
> world of video equipment. My high speed camera (Vision Research v12)  
> generates 1280 x 800 images at 7000 frames per second, and I have no  
> problem working with and distributing the video files.

>

> Frank

>

>>>> "Bill Lehr" <Bill.Lehr@noaa.gov<mailto:Bill.Lehr@noaa.gov>>

>>>> 5/24/2010 6:15 PM >>>

> Our guys will do whatever the team wants.

>

> On 5/24/10 2:45 PM, Peter Cornillon wrote:

>> Bill,

>>

>> I wonder if it would be useful for your editing guys:

>>

>> 1) To make a low quality subsampled video, e.g., one frame a second

>> or

>> one frame every few seconds, and

>>

>> 2) To break the high quality video into say 5 minute segments.

>>

>> We could then use the low quality video to collectively choose one or

>> two reference times that everyone would use for a first estimate, and

>> then, assuming that we have good agreement between the groups, we

>> could choose a suite of times to sample and divide them up among the

>> different groups to get a sense for how the flux varies in time.

>>

>> I'm assuming that the full resolution, high quality videos (2 above)

>> can be saved in such a way that one can easily identify and download

>> the segments of interest from the browse video. Note that this will

>> not preclude looking at sections of the high quality video in the

>> initial selection phase.

>>

>> Given that the file is too large to FTP to Seattle, it seems that we

>> need to have a plan in place to efficiently select and acquire the

>> segments of interest once they have been transferred. I've offered

>> one alternative for doing this above. Another alternative is to have

>> someone at Seattle do the subsampling/selection, but my guess is that

>> the group will quickly find that they want more. Furthermore, we do

>> not have the context that would have if we had a browse video.

>>

>> What do the rest of you think about this?

>>

>> Peter

>>

>>

>> On May 24, 2010, at 4:55 PM, Marcia K McNutt wrote:

>>

>>>

>>> Right. The problem is that the workclass ROVs record their data in  
>>> one large file. No EOFs during the deployments, which can last for  
>>> more than a day. When BP tried before to use simple tools to extract  
>>> segments of video from these huge files, they ended up degrading the  
>>> quality such that it wasn't useful for scientific analysis. Not  
>>> wanting to do that again, they left the entire file intact, and just  
>>> provided the video time codes for the sections that would be the  
>>> best

>>> for analysis thinking that people could just fast forward to those  
>>> places. However, the file itself is too large to FTP to Seattle.

>>>

>>> BP offered to get a professional video editing company in this  
>>> evening to edit out the sections that were selected and then FTP  
>>> those short sections, but Bill decided it would be better to just  
>>> Fed

>>> Ex the disk overnight to him in Seattle and let his folks there do  
>>> the job. That way he will have all of the data and can choose what  
>>> looks best.

>>>

>>> Another setback. Sigh :(

>>>

>>> Marcia

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>>>

>>> Date: 05/24/2010 04:41 PM

>>> Subject: UPDATE

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>>>

>>>

>>> Apparently the video data is contained on a hard drive with other

>>> clips

>>> that are not useful and the BP folks in the Gulf do not have editing

>>> capability on site. Dr. McNutt is arranging for the hard drive to be

>>> fedexed to NOAA-Seattle where we have staff from some of our sister

>>> groups who can edit it for us.

>>>

>>> In the meantime, how is the analysis going on the smaller leak?

>>> Anybody

>>> have any numbers yet?

>>>

>>>

>>

>> --

>> Peter Cornillon

>> 215 South Ferry Road

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