Fw: Submerged plume studies
----- Forwarded by Mark K Sogge/DO/USGS/DOI on 09/10/2010 02:51 PM -----
From: Mark K Sogge/DO/USGS/DOI
To: CJ Beegle-Krause <CJ.Beegle-Krause@noaa.gov>
Cc: csherwood@usgs.gov, Robert.Pavia@noaa.gov
Date: 06/05/2010 11:54 AM
Subject: Re: Fw: Submerged plume studies

Hi CJ,

I did not see a message that Chris was able to respond to you yet, so here is the simulation file.

Mark

Mark Sogge
2255 Gemini Drive, Flagstaff, AZ 86001
Cell: 928-606-1286; FAX: 928-556-7266
mark_sogge@usgs.gov

From: CJ Beegle-Krause <CJ.Beegle-Krause@noaa.gov>
To: Mark K Sogge <mark_sogge@usgs.gov>, csherwood@usgs.gov
Cc: Robert.Pavia@noaa.gov
Date: 06/04/2010 12:52 PM
Subject: Re: Fw: Submerged plume studies

Hi Chris and nice to meet you, Mark,

Due to the forwarding, I don't have Chris's simulation. Chris, and you resend?

We are using CDOG, the Clarkson Deepwater Oil and Gas model which is designed to simulate deepwater well blowouts. CDOG is a great model, we're not so experienced at animating the subsurface particles to make cool pictures and movies.

Look forward to hearing from you.
CJ Beegle-Krause

Robert.Pavia@noaa.gov wrote:
> Mark, I am passing this information on to CJ who is our lead for conducing 3-d simulations of the oil release. The Woods Whole team should not hesitate to contact CJ. SINTEF has also be doing 3-D simulations under contract to BP. It will be important to look a simulation in the context of the data to both validate our intuition about what the data are telling us and to verify the model outputs.
>
> Thanks for passing this information to us. Bob
>

> ----- Original Message -----
> From: Mark K Sogge <mark_sogge@usgs.gov>
> Date: Friday, June 4, 2010 7:02 am
> Subject: Fw: Submerged plume studies
> To: Robert Pavia <Robert.Pavia@noaa.gov>
>
>
>> Hi Robert,
>>
>> When the Brooks McCall team was getting underway, I called Chris
>> Sherwood
>> - one of our USGS scientists at Woods Hole who does a lot of ocean
>> modeling. He was very interested in the team's activities, and
>> offered to
>> be of service in any way possible.
>>
>> I just received this email from Chris, transmitting a demo simulation.
>> I
>> don't know if this is of interest to the Brooks McCall team, but
>> thought I
>> would pass it on to you in case you want to bring it forward. You are
>>
>> better suited than I to determine its relevance to the team, or its
>> potential future use.
>>
>> Mark
>>
>> Mark Sogge
>> 2255 Gemini Drive, Flagstaff, AZ 86001
>> Cell: 928-606-1286; FAX: 928-556-7266
>> mark_sogge@usgs.gov
>>
>> ----- Forwarded by Mark K Sogge/DO/USGS/DOI on 06/04/2010 08:57 AM -----
>>
>> From:
>> Christopher R Sherwood/GD/USGS/DOI
>> To:
>> Mark K Sogge/DO/USGS/DOI@USGS
>> Cc:
>> rsignell@usgs.gov, Sonya A Jones/WRD/USGS/DOI@USGS, Walter
>> Barnhardt/GD/USGS/DOI@USGS, John W Haines/GD/USGS/DOI@USGS, Richard Z
>>
>> Poore/GD/USGS/DOI@USGS
>> Date:
>> 06/04/2010 06:18 AM
>> Subject:
>> Submerged plume studies
>>
>>
>> Hi Mark,
>>
>> Attached is a demo simulation of a cloud of neutrally buoyant
>> particles
>> released at the blowout site with an initial depth of 800 m (red dot).
>> The
>> intial cloud had radial spread of 2000 and a vertical spread of 100 m.
>> The
>> particles were advected with the 4D current field provided by Ruoying
>>
>> He'sNC State SABGOM simulations using the ocean model ROMS, plus
>> random
>> motions that correspond to the vertical and horizontal dispersion
>> estimated by the model (or guessed at). The animation simply shows

>> four
>> different 3D views of the same field of 1000 particles at hourly
>> intervals. Note huge vertical exaggeration and truncated vertical
>> axis.
>> The cloud moved a net of ~10 - 15 nautical miles over 5 days, but you
>> can
>> see that the velocity varied. I am working on a longer simulation, but
>> it
>> will require some minor code changes.
>>
>> The simulation was performed using LTRANS, originally developed by
>> Elizabeth North at Univ. Maryland - Horn Point for larval transport,
>> and
>> slightly modified by her programmer (Zack Schlag) and USGS for this
>> case.
>> The simulations were done by grabbing model output from the on-line
>> repository maintained by NC State (thanks in part to USGS development
>>
>> efforts by Rich Signell for USGS projects and the NOAA IOOS project).
>> This
>> approach means we could run this type of simulation for a variety of
>> cases
>> (release points, release times, particle characteristics), and force
>> it
>> with various models, including forecast models and long-term hindcast
>>
>> statistics (e.g., the POM runs done by Oey).
>>
>> Particle behavior in LTRANS can vary, depending on particle age,
>> vertical
>> location, and ambient water properties, including water temperature,
>> salinity, density, and light. So, for example, this approach might be
>> able
>> to simulate the rise velocity of oil droplets with a specific size and
>>
>> density, and allow either of those properties (and therefore rise/fall
>>
>> velocity) to vary with age.
>>
>> As I said in our phone conversation, there are two approaches to this
>> kind
>> of particle transport simulations. LTRANS takes a Lagrangian approach:
>>
>> given 4D fields of velocity, mixing, and water properties, it tracks
>> particles. Another approach is to calculate particle locations at the
>> same
>> time that the other properties are being modelled...this is how
>> temperature, salinity, and other tracers are moved within an ocean
>> model....some call this an Eulerian approach. There are different
>> advantages to both approaches, and Scott Peckham (Univ. Colorado and
>> part
>> of the CSDMS project) is trying to instigate NOAA RAPID funding for
>> both
>> of these approaches.
>>
>> LTRANS is an open-source model (as all good models should be) and
>> could be
>> enhanced to simulate far-field behavior of oil, gas, hydrate,
>> dispersant,
>> and drilling mud particles, using some CDOG or DeepBlow algorithms.
>> This
>> could be done as a purely government effort using a NOAA or Navy model
>> to

>> force it (bad idea) or as a collaboration with U. Maryland, NC State,
>> and
>> other academic modellers (better idea). It is quite reasonable to
>> initiate
>> real particle simulations now, but there is also work to be done to
>> improve LTRANS performance, incorporate the correct particle behavior,
>> and
>> validate the model against test cases and ongoing measurements.
>>
>> I think we should also support development of the Eulerian approach,
>> in
>> collaboration with the ROMS developers at Rutgers. ROMs has very good
>>
>> advection schemes for moving particles both horizontally and
>> vertically,
>> and several sophisticated turbulence submodels for characterizing
>> mixing.
>> My suggestion is the Hernan Arango (in charge of ROMS code at Rutgers;
>>
>> also an open-source model) should collaborate with USGS and experts on
>>
>> droplet behavior) to develop ROMS routines that should be run using an
>>
>> established Gulf of Mexico forcing setup (e.g., the NC State model).
>>
>> Please pass this along to your Submerged Plume group for
>> consideration,
>> and give me a shout if you have any questions.
>>
>> Thanks, Chris
>>
>> --
>> Christopher R. Sherwood <csherwood@usgs.gov>
>> U. S. Geological Survey, Coastal and Marine Geology
>> 384 Woods Hole Road, Woods Hole, MA 02543-1598
>> 1 508 457 2269 voice 1 508 457 2310 fax
>>
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