

American Geophysical Union AMA: Hi Reddit, I'm Tamay "Ozg"okmen, I explore what type of ocean currents brought the Deepwater Oil Spill from the bottom of the ocean to the pristine beaches along the Gulf of Mexico. Ask Me Anything!

AmGeophysicalU-AMA ¹ and r/Science AMAs¹

¹Affiliation not available

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Consider this low prio, I found it interesting when I read the headline but I doubt it's the most important to have answered.

anyways: it is my understanding that in neuroscience/-anatomy the real big leaps forward have come during wartime, because at war you get such a hefty sample size of people with damaged central nervous systems. I was curious if it's the same with learning to predict ocean currents, that disasters like a huge oilspill are the real goldmines when it comes to sample data? cheers

[throwawayswede123](#)

absolutely, we made huge progress about ocean currents during the past few years.

Actually, this theory of "crisis" applies to many other areas. The great majority of progress and change happen during and in the aftermath of a crisis (usually called "creative destruction" in some circles). Then people settle on repeating the same things for decades. Break through progress is not an incremental thing but comes as a shock wave. I find that the same theory applies to many aspects of life (individual or societies), stock market and economy, political change, perhaps natural changes etc... of course, wars are big shocks... yes, thought provoking!

Hi Dr. Ozgokmen,

Of the ~4.9 million barrels that were estimated in the spill how much did your models show reaching the beach? What about pooling at the bottom of the GoM? Also did the use of dispersants change your models at all? Maybe a better question is how were the properties of the oil accounted for in the model (if at all). Thanks!

Side note: could be because I'm on mobile but I got error 404 on all of the links provided

[lاراناتور](#)



it seems that there is quite a bit of good responses to this question already. Dispersants are designed to reduce surface tension and break up oil droplets (think detergent or soap). For dispersants to act, they need to get in contact with oil, so there were for the first time sprayed in the source of the deep plume to be most effective. The indications are that the surface signature of the spill reduced as the oil spill lost buoyancy and remained subsurface.

There are many different types of oil and the only way to match is by sampling what was leaking (so-called Macondo oil). Yes, people try to account for the properties of oil in many different models they run.

Sorry if this is not a question you want to answer as it does not directly pertain to any scientific matters.

What is your opinion on the new "Deepwater Horizon" movie. They have been showing the trailer for the movie non-stop during prime time TV with a marketing budget a size I couldn't even imagine. To me it looks like an attempt to whitewash the event and take the focus away from BP to make it seem like a heroic tale of those who worked on the rig. I don't want to take anything away from the rig workers or what they did, but this seems like a ham fisted attempt by BP to buy some good publicity from a man made natural disaster that they created.

Thank you for your time and all the research you do to help our environment.

[TequilaMico](#)

I have not seen the movie yet, coming out this weekend right? I will go and see for sure!

1. How much permanent effect is the oil having as far as your research has shown? I get that this is a broad question, you can hit the broad stroke points.
2. How much effect do oil spills have on ocean acidification in general, if at all?

[ThisSavageWay](#)

1. Possibly the number one effect oil has had on our research is that oceanographer had never measured currents in the upper few centimeters in the ocean. This is where the oil collects. Typical research was driven by Cold War, submarine war fare, which is deep ocean circulation... We had to develop a number of new instruments to measure currents right the surface.
2. Good question! Never thought of that before... :)

Does your research point us toward any better response measures than was used in the gulf spill?

[nomorecashinpolitics](#)

Yes, absolutely. In particular, we have now improved ways of tracking the oil and predicting where it will go. This is important because an oil spill of this size requires some type of optimization of resources in response, and this is best done if people have a better idea of where the spill is going, how fast it is growing and how much oil is associated with a particular area.

I know that natural oil springs are very common in some areas, and the chemicals they used to clean up this oil spill have been some pretty toxic stuff. Would the spill have done more damage if the dispersants weren't used?

[rhinocerosGreg](#)

This is of course a very controversial topic. My personal view, which may be correct or not, is that BP did the right thing by applying the dispersant at the source and letting 30-40% of the spill to be ingested by critters in the ocean and other means. The alternative was to let this to be burned at the surface, or applying dispersants at the surface, or let it wash ashore and collect from there. None of these is a better solution. I have no doubt that in the case of an oil spill, all parties are trying to solve the problem. The solution consists of two parts; human intervention and nature. It is inevitable that natural degradation is part of the solution. Personally, I think that the solution adopted during the very long spill was a good one. Of course, it was a frontier well and anytime one does something never done before, mistakes can happen.

How did you get into your field? Is it something you have always wanted to do?

[xuz7](#)

I studied fluid mechanics as part of mechanical engineering (BS, MS, PhD). When I graduated, I realized that oceanography is full of very challenging problems, and I felt that I could contribute to it using my engineering background. I never really consciously wanted to be an oceanographer, but it happened all so gradually; year after year, I fell more into it... 21 years and counting. I guess this is what it is going to be ! :)

I live in Florida and fish on the Gulf Coast in the Big Bend area recreationally. What happens to the oil that was spilled during that crisis? Does it settle to the bottom of the ocean? Is it dissolved eventually?

[Freudian](#)

About 30-40% remained subsurface, some of which eventually settled on the Gulf floor and the rest was (or being) eaten by critters at sea. Some of this will propagate up the food chain probably. Some of what was surfaced was burned and collected, the rest washed shore and then collected. NOAA published budgets for these.

Hi Tamay,

Given your involvement in this type of research, do you have any thoughts on [AGU's board continuing to accept funding from Exxon Mobil](#) despite growing calls for them to acknowledge, via denial of that funding, that the petroleum industry has been obfuscating climate research for decades? You're not a signatory on the letter signed by many AGU scientists, so I'm curious if you have any unspoken insights about this apparent conflict of interest. Thanks!

[capecodnative](#)

I think that the core of the objection against Exxon is that they tried to hide their insight about fossil-fuel based CO2 creating climate change. I am kind of split on the topic due to these reasons:

Oil companies simply provide the energy needed for modern societies to function at the present. 70% of that fuel goes to transportation and at the present, we do not have alternatives to oil and gas for moving planes and trucks. Elon Musk is my hero, and if he succeeds, it will go a long way to reduce the usage of oil. There are close to 2 billion cars in the world, 100 million new cars sold, and rapidly increasing by China and India. Tesla plans to reach 1 million per year, so it is rather a small number (1%) unless other car companies join the trend. Until this transition happens, it is better to be independent from other oil producing nations (OPEC and Russia, each producing 1/3rd of global oil).

Therefore, the situation is not similar to tobacco companies, in which stopping tobacco as soon as possible was in fact good for health. Unfortunately, the world is not in a position to stop fossil fuel usage today, and much technological development is needed. Until then, we need the oil and gas.

I also think that 35k given by Exxon for student breakfast is not something that should be used against AGU. I actually think that the scientists who are pressing on this issue are doing a disservice to AGU at the moment. Reputation is hard to build but easy to destroy, so why are they aiming at AGU so strongly and painting with such a negative brush? It is not helpful in my view.

We all live on the same planet and have to work together to solve problems facing humanity. One needs to focus on the common ground to leverage common actions. Personally, I would like to see a huge investment in renewable energy technologies. US is the place to do this, to succeed and there will be tremendous economic advantages and all this will be behind us soon after.

Hello! Looking at the way the spill moved was there anything that surprised you?

[Shaeos](#)

Absolutely! There is no way oceanographers could visualize the ocean by pouring millions of barrels of dye, and it turns out that oil is a very efficient substance to track ocean currents. So, we could see all kinds of things that we could never ever see before during the DwH event, because there were so many aerial shots and other images. This has definitely helped development of ocean theories over the past few years.

This may be outside of your expertise, but what are the economic costs of the spill? I'm sure the fishing industry has been hurt, but are there other costs beyond that?

Also, off topic and in the truly asking anything vein, with the current situation in Turkey, would you ever return, even for a visit?

[AFreebornManoftheUSA](#)

I think that BP paid so far in excess of \$54 billion and the total penalties may end up getting close to \$70 billion. The Gulf has a tourism industry on the order of \$80 billion/year, so the amount of damages paid by BP will be more or less equivalent to loss of a single year of revenues by all states.

I used to travel to Turkey 3 times a year to see my parents and sister but I do hesitate now a bit... yes... :(

Do you have hope that we as a world will ever be able to recover from the damage we have done to the earth? Or at the very least stop creating more? Thanks :)

[BrothaBudah](#)

good question! No, I do not think that there is a return to how things were say 200-300 years ago (pristine nature). It is because both the global human population and global consumption are on a hockey stick curve; there is huge momentum for the foreseeable future. We will probably get to a new state that will reflect human impact on the planet.

This is going to be out of context so I apologize in advance.

Without any research, based on your last name I assume you are Turkish. What was your journey? Did you born and raised abroad or made your way trough there? Your education, what scholarship did you get? And everything.

I kind of wasted my potential but I have a young niece who is really really smart and loves "the stars". I want to be a good mentor for her and help her throughout her education and school life to achive his dreams.

And also, a classic question from one Turk to another(of course if you are not I am sorry for my mistake) what team do you support?

Thank you.

[matrimc7](#)

Hi! :)

I went to Bosphorus University and then came to US on research scholarships for both MS and PhD and got a faculty position at the University of Miami. I was fascinated by the US Space Program and Moon Mission in the early 1970s as well as Star Trek ("to go where no man has gone before"). The technical and research capability and support and spirit for exploration in the US is really rather amazing and those have been the main attractions.

But I think that it is really dependent on the person; some will be attracted to business, others to finance, others to medicine and music; what ever makes one lose the sense of time and makes enthusiastic. Also, it is important to be able to dream to accomplish something quite extraordinary. Any goal and activity that is inspiring is a good one, I think.

Fenerbahce :)

Best wishes to you and your niece!

- Do lunar phases and sea temperature play an important role in spill flow ?
- Are there other scientific disciplines apart from Geophysics that also deal with this very problem ? If so, how much collaboration is there between the different scientific branches involved, and what is its relative importance for the obtention of the healthiest data and estimations ?

Best of luck with your work, salutations from the Alemdar family, much love, Tolga

[faransavi](#)

Hi Tolga! What a surprise!!! Please tell my regards to your fther, mother and sister :)

- Yes, the moon creates tides in the ocean. While tides are rather small in the Gulf of Mexico, they are still important and need to be considered for predictions. Temperature is also very important since it determines ocean density and how it flows.
- I think that the oil spill problem turned out to be a very rich one that brought together oceanographers, biologists, chemists, computer programmers, ocean instrument developers, policy makers, government response agencies, the US Coast Guard, public communicators, film makers and many many other types of people. The problem has the fundamental nature of bringing all kinds of people together so that solutions can be developed. So, it is actually broader than just science.

Establishing efficient collaboration between all these people is a hard problem, because it needs both efficient communication but people need time to focus on their work and make progress.

Peer-reviewed publications are the best way for the healthiest data since these go through scrutiny

and anything that is not solid is not accepted for publications.

Thank for your well-written questions Tolga and cok cok sevgilerimle :)

Is it safe to eat seafood from the Gulf now? Do you?

[pippilongshanks](#)

I think so. Yes, I do. I travel to Louisiana and Alabama and west Florida coast many times a year (dozens of times since 2010 DwH spill) and always enjoy the sea food.

I was talking to a friend this weekend about global warming, and he seemed to think the melting polar ice caps could counter and stop the oceans currents with catastrophic results. This doesn't sound plausible to me, is there anything to his theory?

[egus](#)

Yes, this is an old theory. Melting of ice makes the near surface layer of the ocean so fresh that it does not sink even when it cools up north. There is a ocean conveyor belt circulation driven by this cooling and it takes about 1000-10,000 years to go around the ocean. So, even if this happens, presumably we won't see the effects for a long time probably! But there is some cold spots (south of Greenland) and hot spots (near Seattle in the Pacific) in various places in the ocean that people have been discovering, so we need to monitor very closely what is happening in the ocean as all these anomalies have usually tremendous climate impacts (such as El Nino, La Nina etc) as well as socio-economic impacts (gas prices, travel problems etc).

Do you believe that a large chunk of the leakage got trapped at depth?

[jtarp26](#)

yes... people say 30-40%. Dispersant injection at the source by BP was intended to "wash away" the oil before it surfaces. The highest socio-economic impacts happens when the oil hits the beaches.

Has anyone done any research as to the positive impact the oil has had on the environment? Releasing significant amounts of organic matter into the food chain should give the ecosystem a long term boost. I have observed this on smaller scales on land.

[celt451](#)

Interesting! I have not heard this type of research but there are a lot of natural seeps in the Gulf of Mexico, this it is an ecosystem environment used to oil.

Knowing the risks and financial costs of an oil spill firsthand, would you advise a petroleum company like BP to continue growing their offshore drilling projects or invest in safer - albeit more expensive - drilling onshore?

[mienaikoe](#)

there are 4000 wells in the Gulf of Mexico. They are effectively drilling everywhere they can find and

there is oil everywhere. Onshore drilling is not necessarily safer, because in the case of a spill, it hits the beaches in no time. If there is a whole lot of ocean between the drilling site and the coast, it is a different scenario.

What is the hardest thing about your job? What would you say to young adults who might be looking to get into this field? Whats the most fun part of your job?

Edit: typos

[SeismicWhales](#)

Perhaps the hardest thing about being a researcher is finding the money to be able to carry out the work; we all spend a lot of time writing proposals that usually have 5% funding rate. Thus there is a lot of rejection and it is sometimes hard to deal with that on a repetitive basis.

I would say that the best part is to think about how the nature really works; it is almost deeply spiritual at that level. Discovering something or making instruments to measure things that have never been measured before are also very exciting.

I live in Ireland and we've noticed the weather getting kind of weirder that last few years. Is there any possibility of the Gulf Stream/North Atlantic Drift moving?

[idohaveamightyroar](#)

It is possible, yes... I haven't looked at that topic for a long time however (my first ever paper was on Gulf Stream path in 1997). But Irland is at a particular location where it is susceptible to variations in North Atlantic Current's path that transports a huge amount of heat northward [unlike Miami, for instance ! :)]. Very interesting problem I think...

Hi Tamay,

Thanks for doing this AMA.

Slightly tangential question but: Does the work you do have other applications, say, in determining drift/location probabilities for wreckage? I'm thinking about the downed Malaysian Airlines flight and boats lost at sea.

[Leircue](#)

Yes, we effectively work on "where do substances go to and where do substances come from". One can backtrack the trajectories but one would need the ocean currents to be able make these calculation; typically from a good ocean model or satellite measurements.

We have just released our drifters developed for the oil spill problem in the Arctic ocean, which is a "new" ocean due to global warming and folks are interested in determining circulation there by using the biodegradable instruments (the environment is pristine and one needs to be real careful not to spoil it) we developed. We also work on coastal pollution problems, for instance, where to place coastal discharges most effectively, which is another problem for which one needs to know about ocean currents; dumping things in stagnant places can create health problems for cities, and it is not at all easy to know which places are stagnant and which are suitable.

How has the dispersant affected like in the gulf stream loop current pass through the area as well.

[westside_g33](#)

Not sure I understand fully, but if you are asking whether dispersants affected the Loop Current in the Gulf, I would say no. These currents are huge and very strong, compared to what was sprayed in deep ocean.

Thank you for doing this!

Are the fines and reparations doing anything to help clean up this mess? How big is the "bath tub" of oil settled on the floor? How has the dispersant affected like in the Gulf? Is it possible to vacuum up the mess on the floor? How much washes ashore? How had this affected life in the Gulf, and food safety from what fish from the Gulf?

<rantYouCanSkip> I'm pretty upset with the shit attitude of the oil companies after not only experiencing this but just reckless extant and spills in South America. I lived in Peru and they declared a national emergency due to the Plus Petrol's handling of extraction. Mainly pumping water filled with heavy metals and other toxins into an unlined pit, using old great that leaks and spills, and generally not giving a f about the environment. The amazon near iquitos has hydrocarbon contamination along the riverbed going down as far as a meter. I met with engineers there who advised of ridiculous methods for dealing with contamination like using diesel to burn off the contamination (brilliant globalize the problem) that was after blending it with good soil was banned. Like none did the food color/celery experiment in 1st grade? Sorry for ranting. </rantYouCanSkip>

[jpastore](#)

Yes, some of the fines will be used for environmental restoration (close to \$20 billion I think). I do not think that it is feasible to vacuum up the ocean floor. There is considerable research going on regarding long-term impacts. I am actually not too familiar on ecosystem impacts.

However, regarding your other comment, I would like to point out the not-well-known fact that environment has no price associated with it. People do what they want with it and the nature just keeps giving and giving. We all take it for granted and assume that nature has infinite healing ability. Yet, if we step back, we can easily see that we all live on a speck of dust in the grand universe.

Hello Professor. Do you mind actually elaborating on the ocean currents and conditions which actually pushed all that oil from that deep in the ocean onto the beaches? From what little I understand some of the components of mineral oil are less denser than water but also that the waters in the various depths of the oceans don't really mix much (i maybe mistaken and if so please do kindly correct me) and a the bulk of the oil ended up deep down in the ocean, so how did a fraction of the oil actually end up on those beaches? Can you explain the processes involved? Thank you!

[half_as_wise](#)

The oil and gas mixture came out of a pipe hat was about 2 feet in diameter at about 1-2 m/s at 1600m depth. On the way up to the surface, layer of oil droplets that mixed with the ambient ocean peeled off and stayed subsurface. There were multiple layers like this, maybe 30-40% of the oil remained subsurface within these layers. These subsurface layers were then carried around in the Gulf by large scale ocean currents. It is also possible that some of the oil fell down the bottom by combining with the sediments coming from the Mississippi river.

At the surface, some of the oil was collected and burned; some got dispersed by the hurricane and

some got loaded by sediments again (Mississippi river outflows or even dust from Sahara carried by trade winds) and sank back on the ocean floor. Oil got sprayed by dispersants that reduced formation of tar balls. Surface oil was subject to winds, currents and waves near the surface. Some of that oil got entrained into the Loop Current and some was transported by wind events onshore, where it encountered transport barriers by river discharges and outlets along the coast.

I am going to stop here because I can actually write pages on this stuff! :) I hope that it was helpful though...

The BP spill hasn't been addressed as the regional threat it is. -How much involvement there is from the rest of the Caribbean countries, specially Mexico? -Does the characteristics of the Gulf make it specially challenging on any way?

[Nuguiler](#)

Mexicans developed their own research program in response to BP spill, funded by their government through their own oil companies. BP oil spill was the largest accidental oil spill in history, but the second was happened in Mexico , IXTOC spill in 1979.

Yes, indeed Gulf has very interesting characteristics. Many of them, so I will just tell a few. It is like a big pool, bathtub and this creates very special characteristics about wave propagation that differs greatly from the open oceans. Waves are very important for oil spills. It is also subject to hurricanes in the summer (there was one during the BP spill) and fronts in the winter. These are fast moving atmospheric patterns with potentially huge impacts on oil spills. Finally, it has the Loop Current in the middle of the Gulf, and this is a major consideration for deep oil drilling as well as in the case of spills. There are many others and I should also say that the Gulf of Mexico was very under-investigated scientifically until this accident. We made significant progress over the past few years, I like to think.

Ultimately we have to work together with Mexico as oil spills are not aware of international borders in the oceans.

How accurate is our modelling in terms of predicting weather patterns based on climate change?

Since ocean currents have enormous impacts on weather, the increase of trapped energy and cascading impacts that follow are both grand and subtle. If one variable gets changed, it changes a host of others, and the models have all sorts of variables changing as we struggle to keep up.

[exgiexpcv](#)

Yes, all correct The way to look at model prediction is the concept of "solution space", as opposed to one prediction. Think of hurricane track predictions; models produce all kinds of tracks which is then converted into an envelope/cone of possibilities and decision are made on that basis. If the model output is more complex than a single trajectory of a hurricane, then this task is more complicated because hundreds to thousands of solutions needs to be considered in ways that you describe nicely above; which parameter change affects the solution, how much, where etc. This is a fairly new field, called Uncertainly Quantification, and it is made possible by the tremendous increase in computer power in that we can generate many many solutions from models very quickly and do not really know what is correct and what is not realistic. Evaluation requires field data.

Was the oil and dispersant carried with the Gulf Stream beyond the Gulf and into the Atlantic? Does the weight and/or color (darker=warmer) of the oil effect currents?

[LudovicoSpecs](#)

Regarding the first question, we do not know the answer, yet. There could be a time when scientist could detect this in the Atlantic; it is not precluded in my mind.

Regarding the second question, we think that the DwH blowout changed the local circulation during the 89 days of the spill. This is because the buoyancy from the spill was very strong (equivalent to storms lasting for months) and forcing the deep ocean like that is a very usual thing. But we could not yet show this for sure, even though we have a paper in the AGU-JGR Gulf Spill special issue on this topic.

You explore the oceans? Have you ever been to Atlantis?

[PM-ME-UR-KEKS](#)

:) not yet! still searching!

Given that roughly 5 million barrels are estimated to have been spilled, to what extent might crude from the Deepwater accident remain at significant depth and surface in the future or at significant distance from the source?

[DirectsTenYeti](#)

Estimations are that about 30-40% remained subsurface; some of that have been eaten by critters and some settled at the bottom, after getting loaded with sediments from rivers and then covered over.

Knowing what you know about the volumes and components of what was added to the Gulf, the oil, the dispersants, everything ... do you or would you eat Gulf shrimp or other food caught there?

[yeesCubanB](#)

Yes absolutely, I did and I will continue.

Ever used a Wave Glider in your research? Or any other autonomous data gathering robot?

[Nomrah48](#)

Yes, we used 2 wave gliders in our experiment this year.

Bulundugunuz alanda yurt disinda ve Turkiye de calismak arasindaki farklar neler?

[STIKBITS](#)

cok buyuk diyebilirim! :)

Unrelated to Deepwater Horizon question; In the near future, do you see ocean water currents stopping or reversing due to global warming?

[jg_y3](#)

I think that it is reasonable to expect some changes, particularly in regions of significant change. For instance, summer time ice cover in the Arctic Ocean is historically low, to the extent that there is a new ocean out there now. My former student (at Yale University now) is deploying instruments there at this very moment from a Canadian Coast Guard ice breaker to measure the circulation. Without ice, it is certainly very different! :)

is the oil spill in the Gulf of Mexico still leaking? and the media simply ignores it?

or has it played out and its only cleanup time now?

[Grande Latte Enema](#)

I do not think that particular site is still leaking. Much of the biodegradation has probably happened already; 5 years after being shut off now.

Have you heard about the possible increase of tar sands being shipped via freightership in the Salish Sea? I think the idea is that they are to go through the Juan de fuca opening, up the Haro straight empty on the US side, fill up on Tar Sands in Vancouver and boat out on the Canadian boarder side.

I've heard British Columbias decision makers are voting in December on a increase in vessels allowed in the shipping lanes (from 80 a year to 420 a year).

I also heard that the smallest funnel of islands the boats have to slip through are 2 miles from an island, (while the Exxon spill happened in a 12 mile wide opening).

Does your work influence these decisions? Even when they are being made in different countries?

Are you able to avoid bias when sharing the information? What is the importance of this?

What factors does your study not include? (Wildlife? Economy? Etc)

[williamowen65](#)

Himm... I had not heard of this? Is this a consequence of XL Keystone pipeline not getting through? I would be very concerned about such plans... It seems to me that it has far more chance for an accident and spill at sea than the Keystone pipeline.

No my work does not affect such decisions. The connection between science and scientists, and large policy decisions is lacking. I have been asking myself why that is so. The answer is that some most important decisions are made on the basis of profit, as opposed to environmental protection. In some cases, there is a win-win scenario, if one thinks about it, but the extra cost and time is often avoided for immediate profit.

Hi! I'm a PhD student in Austria working on landslides. Of course there is very little money in this busines unfortunately. Until I found out, that Shell, BP etc. have their own research units working on submarine landslides in order to protect their pipelines on the deep-sea floor. This has to be so incredibly costly, why on earth are there no publications with regard to that? Are they so afraid of their competitors gaining valuable advantages with that knowledge? This is stupid and should be regulated so that all research must be public (in a perfect world with pink unicorns this would be the case anyway).

[KyrgyzManas](#)

The oil companies are private entities (well, there are share holders), and bo, they do not share information very easily because the business of oil extraction is very competitive. US oil companies are able to extract oil from places where others can't. There are huge economic advantages to this. I do not think regulation as you suggest would work here in the US.

Consider this low prio, I found it interesting when I read the headline but I doubt it's the most important to have answered. anyways: it is my understanding that in neuroscience/-anatomy the real big leaps forward have come during wartime, because at war you get such a hefty sample size of people with damaged central nervous systems. I was curious if it's the same with learning to predict ocean currents, that disasters like a huge oilspill are the real goldmines when it comes to sample data? cheers

[gootermen](#)

yes... I agree. With exceptional circumstances comes exceptional opportunity as well; ying/yang.

Dr. Ozgokmen thank you for taking the time out of your day to do this AMA. While you look at physical oceanography, have you, or any of your RSMAS/NOAA colleagues examined the consequences of the spill to planktonic species, as it relates to their distribution through Gulf currents? Is it as simple as saying the fisheries were decimated or are there differences to be found in the health or existence of planktons in or outside of currents during and after the spill?

[deep in the comments](#)

There is significant work supported by GoMRI on topics you indicate here. You can contact Steve Murawski at U South Florida and tell that I referred you to him. He is so much more qualified to answer this than I do (he was the head fisheries person at NOAA, Woods Hole, MA for years before).

My understanding, though, is that the Mexican Gulf has a very fractured geology, and a lot of oil and gas that have naturally been released into it for 10s of thousands of years, and a [biome that in part depends on those oil and gas leaks](#). Don't you think this is another example of a lot of hype for a relatively small threat? If not, why not?

[amaxen](#)

I tend to agree with aspects of your argument. The difference is that the Deepwater Horizon release was ultra concentrated: about 2 years of worth of natural seep oil was released in 3 months (about 10x faster) and also what would have been distributed over a very large area came effectively from a point release (perhaps hundreds of times more concentrated in terms of area).

You mentioned that your research focuses on surface currents. Would it be possible to apply your new findings in dealing with issues like the Pacific garbage patch, or perhaps fallout effects from the Fukushima nuclear failure?

[amkeyte](#)

Yes, this is the kind of research we would be very interested in. Any type of pollution near the surface of the ocean as well as coastal pollution where people live in large coastal cities (some of the largest cities on the planet are established near the sea); we like to track these because currents are always more complicated than people imagine.

Do you cry yourself to sleep at night, or have you effectively learned to block out the utter destruction of our planet? I don't think I could focus on this for hours at a time, let alone make a career of it.

[Jmlips](#)

actually this line of thinking never occurred to me. In very fundamental way, I do not think that there is "destruction" in the universe; it simply consists of carbon and hydrogen so on; everything appears as "live" for some time and goes back to some basics elements after a while. We simply observe what is out there and try to understand the mechanisms at some depth, without making any judgment about what it should be. It is usually so complex that one is only humbled.

What kind of data acquisition techniques do you use? Measuring ocean currents over a large area is hard, so how do you figure out what is happening with enough resolution to produce a useful model?

[ckfinite](#)

We use GS-tracked drifters that go with the flow and transmit their positions every 5 mins to our servers. We have deployed 1100 of these in 2016 so we could track ocean currents over large areas (a significant part of the Gulf) in real time. They are of course biodegradable because we do not want to harm the environment whole making measurements.

The modeling is somewhat lagging behind. This is because the world ocean 10^{27} or a billion times a billion times a billion, degrees of freedom, while most models truncate this to a billion moving parts (or less). So, the nature is a billion times a billion more complex than how we model it and this seems to matter!

I have heard that when deep water horizon happened, it was very difficult to find the oil. Why aren't oil drilling platforms required to have sensors to track ocean currents around them?

[Claytonread70](#)

The oil rigs are required to have ADCPs (acoustics Doppler current profilers) installed on them and make this data available to national data centers. However, DwH was at the leading spot and the eastern part is protected area (no oil platforms permitted). There are also significant differences between measuring currents from fixed platforms vs with instruments moving with the currents naturally; the latter is much more effective.

Do you collect real-time data when oil spill accidents occur? How do you deploy equipments and what equipments do you use?

[jadelord](#)

We can deploy biodegradable surface drifters to track oil spills. These provide data every 5 mins that is very intuitively visible through our data servers. We have also in some instances made this data available in real time to response agencies.

what sort of data is there available for ocean currents? are there dedicated instruments out in the Gulf right now?

[JasonBornLoser](#)

The typical data set for ocean currents comes from satellite sensors (maintained by NASA). Currently, these instruments measure sea surface height and relate it to currents. But this method does not detect small-scale currents that can be sometimes very strong and relevant to oil spill dispersion.

In order overcome these inaccuracies, we have deployed over 1500 drifters in the Gulf since 2012. Drifters measure surface currents very precisely. But the batteries last only few months so we do not have any transmitting in the Gulf at the moment. Without these large drifter data sets, actual current measurements fall back to a few data points.

We have two plans for the future: (1) We want to ideally populate the ocean with biodegradable drifters. The flows that can be detected by these will not be only for oil spills but for saving fuel during navigation of large vessels or to avoid accidents during construction at sea. (2) NASA is working on sensors that can actually measure ocean currents from airplanes and this system will be portable to space. We have a joint experiment planned for April 2017, where we will provide ground truth for this NASA instrument with our drifters, and hopefully it will be calibrated and provide data globally in the future.

Are you going to go see the Deepwater Horizon movie, and if so, what gross inaccuracies are you predicting?

[S_Dub7](#)

Yes, I will of course see it. I do not know what to expect (which is part of the suspense!).

How much are your union dues? I think I may be paying too much.

[Lexam](#)

I do not get paid for this session.

Are you Turkish ? If you are "seninle gurur duydim".

[Luchador13](#)

yes... thank you! :)

Why is your nickname unpronounceable by humans?

[sosomething](#)

:) LOL I wonder about that as well sometimes.