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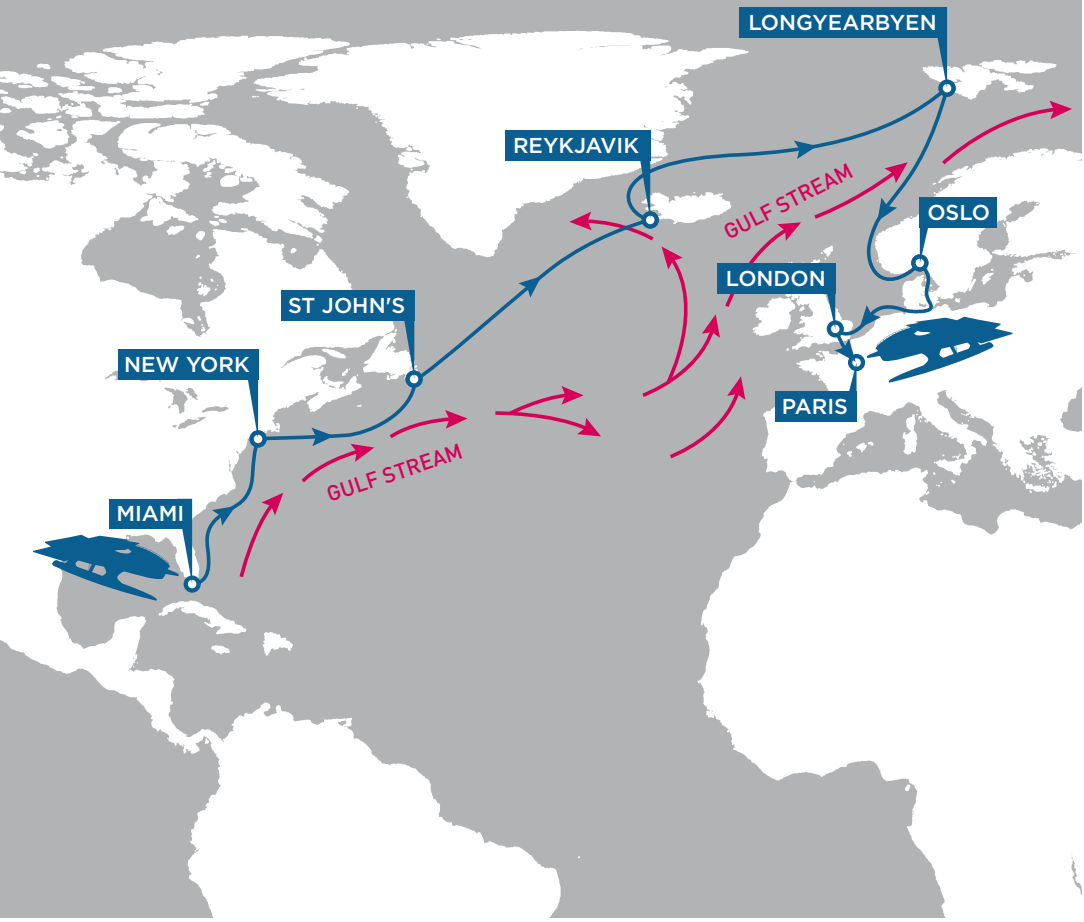
Power The World With Solar Energy

UNIVERSITÉ DE GENÈVE

PLANETSOLAR DEEPWATERPROJECT

FROM INNOVATIVE SCIENCE TO RAISING AWARENESS AND PUBLIC OUTREACH



«ONE DAY, MEN WILL BE CAPABLE OF SAVING OR DESTROYING EVERYTHING»

Jules Verne

WHEN A SCIENTIFIC EXPERIMENT BECOMES AN AWARENESS RAISING TOOL

The objective of the "PLANETSOLAR DEEPWATER PROJECT" is to use the exclusive features of the "MS Tûranor PlanetSolar" – the biggest solar boat ever built that has accomplished the first around the world tour powered exclusively by solar energy – to carry out a unique scientific measurement expedition along the Gulf Stream, also referred to as the "North Atlantic Drift", and to contribute to raising awareness about the reality and complexity of climatic change.

The ocean current that transports heat from the Tropics to the Arctic across the Atlantic Ocean is one of the most significant regulators of climate. Satellite imagery and Earth-based observations have reasonably well documented the features of the Gulf Stream, but the relatively small scales related to deep water formation - the dense saline and cold waters that activate the deep water currents of the global ocean - remain relatively unexplored.
Any perturbation to zones of deep water formation, related for example to a warming climate, could have vast repercussions on the global climate since the temperature characteristics of the North Atlantic Ocean would be deeply modified. The project thus seeks to identify and document subtle changes in the behavior of the ocean-atmosphere interface along the course of the Gulf Stream, from its inception in the Caribbean to its bifurcations in the northern reaches of the North Atlantic.

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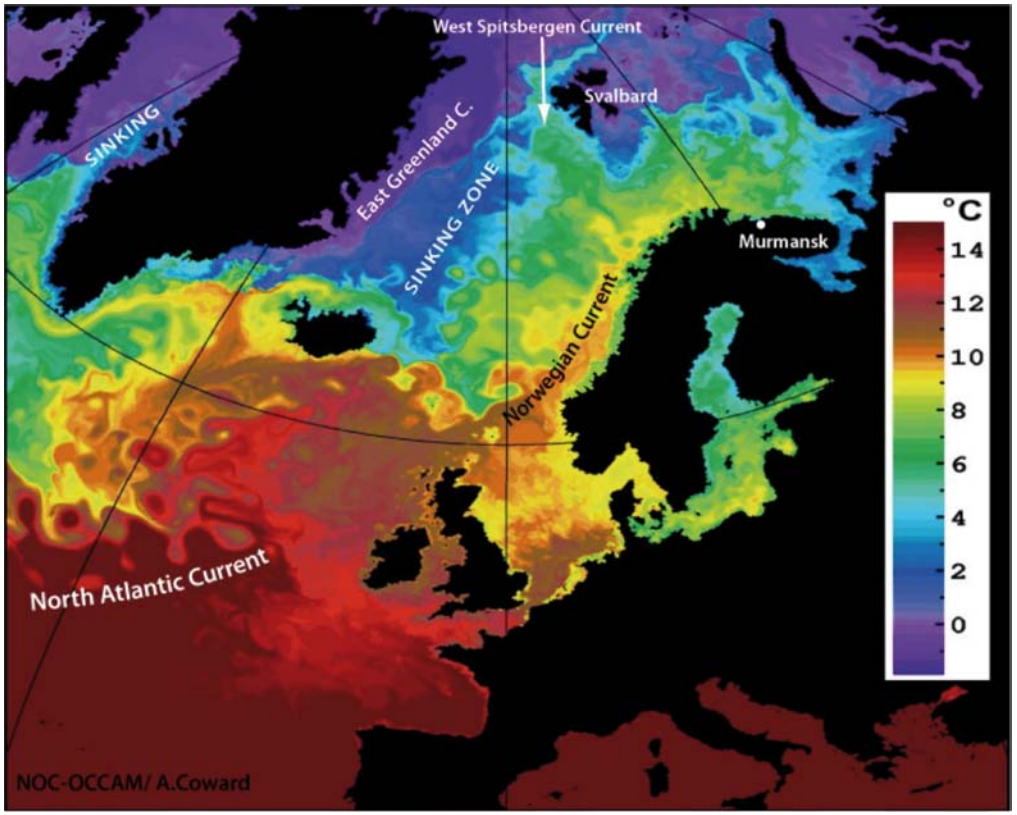


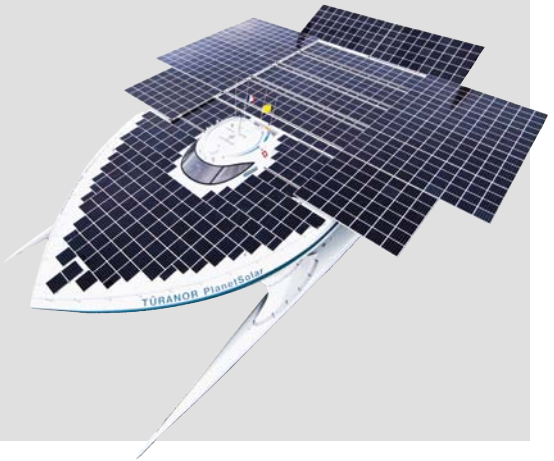
Modelled sea surface temperature, highlighting zones of sinking (i.e., deep-water formation)

From EU/FP6 «SEOS» Project http://www.seos-project.eu

Beyond the purely scientific aspect of the project, it is expected that the exploration of the very emblematic Gulf Stream by a solar-powered vessel and the results that will emerge, should help raising awareness about the reality and complexity of climatic changes. Appropriate flow of scientific information to decision-makers at economic and political levels will improve the capacity for relevant decisions to be made in the fields of adaptation and climate policy. This will indeed be crucial in upcoming years considering the slow pace of negotiations aimed towards a post-Kyoto protocol ; a first major step towards intervention is scheduled for 2015, and the scientific information generated by the "PLANETSOLAR DEEPWATER PROJECT" in 2013 and 2014 will provide new arguments for the upcoming climate negotiations.

"PLANETSOLAR DEEPWATER PROJECT" TOP-LIST OBJECTIVES :

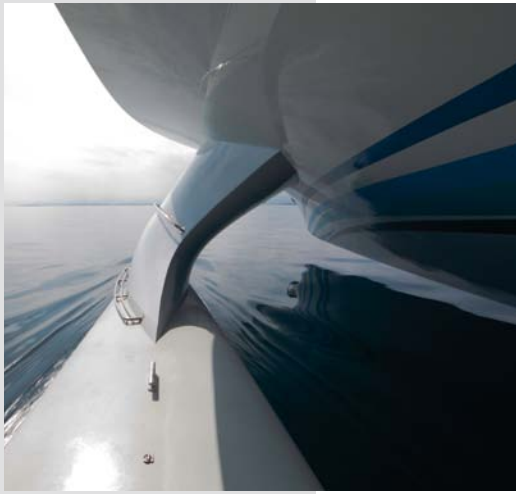
- Provide unique measurements, which have never been collected at such scales before, allowing for a better understanding of climate-relevant processes along the trajectory of the Gulf Stream
- Proceed to continuous atmospheric and oceanic measurements, including dynamic and gas-phase fluxes at the ocean-atmosphere interface, along a transect from Florida to Svalbard (Spitzbergen/Norway)
- Ensure direct measurements of chaotic behavior in the vicinity of mesoscale ocean vortex trains
- Collect measurements in the region of North Atlantic Deep Water (NADW) formation (abrupt salinity and temperature transitions, and changes in ocean microorganism composition and abundance)
- Study correlations with real-time remote satellite data (e.g., of ocean superficial photosynthetic activity)
- Exploit the results for climate models, in particular to improve the representation of small-scale climate-relevant processes as surface boundary conditions for coupled atmosphere-ocean models
- Establish a common data bases for oceanographic and atmospheric investigations and joint publications
- Develop an education and outreach program (schools; general public) during and after the expedition
- Demonstrate the potential and reliability of the MS Tûranor PlanetSolar as a scientific exploration vessel

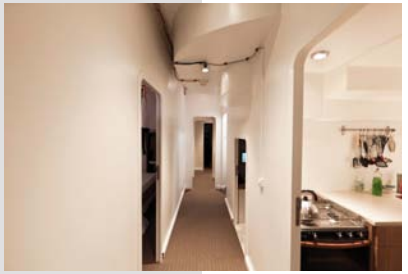


A SOLAR-POWERED VESSEL COUPLED WITH INNOVATIVE INSTRUMENTATION

The marine route is scheduled to depart Florida in Spring 2013 and reach the far North, at the edge of the Arctic ice cap, a couple of months later. Pioneering laser-based instrumentation will be embarked on board " PlanetSolar " to provide continuous measurements of atmospheric and oceanic chemical and biological components. These measurements will help detect transitions in the abundance and composition of ocean microorganism and chemical elements injected into the atmosphere by breaking waves. Underwater high-tech equipment will also simultaneously sound the upper water layers beneath the ocean surface. The hypothesis is that abrupt transitions in chemical/biological characteristics are likely to be related to mesoscale ocean vortices along the Gulf Stream (rather chaotic elements of the surface ocean flows), and more specivically to zones of deep water formation which can be portrayed as " cylinders " of cold, saline, and oxygen-rich waters (in terms of the O-18 oxygen isotope), whose dimensions rarely exceed a few kilometers.

In scientific terms, the use of the MS Tûranor PlanetSolar as the ideal platform for these scientific experiments is justified by several factors, in particular its relatively slow speed that enables small-scale oceanic features to be adequately documented and mapped, the stable trajectory, and the absence of pollution linked to the combustion of bunker fuel. Indeed, this last point is crucial, since the " signature " of many organic compounds in the natural environment is close to those found in the exhaust fumes of ships; fumes thus significantly contaminate the measurements, and for the first time thanks to the characteristics of " PlanetSolar ", the measurements will be sampling exclusively natural environmental conditions.





ABOUT PLANETSOLAR

PlanetSolar SA is a Swiss based initiative founded in 2004 with the aim of achieving the first around the world tour only powered by solar energy to demonstrate the potential of solar energy. The MS Tûranor Planet Solar is the biggest solar boat ever built and is covered with 537 m^2 of photovoltaic solar cells. After two years of design and construction, Planet Solar is behind many technological advances, especially in the field of composite manufacturing and storage of solar energy. The vessel possesses the largest civil mobile lithium-ion battery that permits 3 day navigation autonomy in case of bad weather. The expedition around the world has been completed on May 4th 2012 after 19 months of navigation following a route close to the equator.

FEATURES OF "THE" MS TURANOR PLANETSOLAR

0 LITER FUEL CONSUMPTION

0 CO_2 EMISSION

2 ENGINES PER PROPULSION SYSTEM : 1 **40KW** ENGINE AND 1 **20KW** ENGINE

2 PROPULSION SYSTEMS PORT AND STARBOARD

6 CABINS

23 METERS OVERALL WIDTH

6.10 METERS HIGH

35 METERS OVERALL WIDTH

95'000 KG EMPTY WEIGHT

AVERAGE CONSUMPTION **20 KW** (17 KW MOTOR AND 3 KW FOR LIFE ON BOARD)

537 M^2 OF PHOTOVOLTAIC CELLS, I.E. **38'000** CELLS

10 KNOTS MAXIMUM SPEED

120KW MAXIMUM POWER

AT LEAST **4** CREW MEMBERS

2 PROPELLERS WITH **5** TAPERED BLADES FOR **2 METERS** IN DIAMETER, TURNING BETWEEN 100RPM / MAX160RPM

5 GUINESS WORLD RECORDS

ABOUT THE TEAM

PROJECT LEADER

Martin Beniston, Professor at the University of Geneva, Director of the Institute for Environmental Sciences and specialist in climate research. Former vice-chair of the Intergovernmental Panel on Climate Change (IPCC; Co-recipient of the Nobel Peace Prize in 2007), elected member of the Academia Europea.

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SCIENTIFIC TEAM

Jean-Pierre Wolf, Professor at the University of Geneva, Department of Applied Physics, specialist in laser technologies for remote-sensing measurements of the environment.

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Jérôme Kasparian, Senior Scientist at the University of Geneva, Department of Applied Physics, specialist in laser technologies and instrument development.

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