Ocean gliders to show impact of Agulhas Current on coastal regions

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Like drones, ocean gliders are autonomous robotic platforms which can be piloted from land. In June 2017, two ocean gliders will be released off Richards Bay as part of the Gliders in the Agulhas (GINA) scientific experiment. GINA is a multi-institutional project lead by Principal Investigator (Pi) Dr. Marjolaine Krug (CSIR) and Co-Pi Dr. Juliet Hermes (SAEON). During GINA, an SV3 Liquid Robotic Waveglider (Figure 1) and a Seaglider (Figure 2) will undertake a 2 month journey from Richards Bay to Port Elizabeth. Throughout their southward journey the two gliders will measure a range of oceanic parameters. The collected information will in turn be used by marine scientists to improve our knowledge of how the Agulhas Current influences the coastal regions along South Africa's eastern shores. We appeal to the community to NOT interfere with the two glider platforms shown in Figure 1 and 2 as this would compromise the scientific experiment and might result in the glider platforms and the sensors being damaged.

Improving our observations of the Agulhas Current is important to better understand our global and regional climate and weather patterns, as well as the variability of our coastal marine ecosystems. The Agulhas Current which flows along the south eastern shores of South Africa is one of the most powerful current in the world. Like the Gulf Stream, it is a major driver of the global climate, playing a vital role in moving warm water from the tropics towards the poles. Surface velocities in the Agulhas Current often exceed 4 knots and the current transports on average 80 millions cubic meters per second of warm waters south-westward. The Agulhas Current flows in close proximity to the shore and therefore slight changes in its direction or strength directly impact coastal and shelf regions. The Agulhas Current impacts major economic activities like fishing, oil and mineral exploration and ship routing. Its role in the generation of rogue waves imposes a severe safety issue on large vessels. Variations in the Agulhas Current may also modify ocean currents near the coast and alter the water properties and therefore the biology of the marine coastal ecosystems.

Our understanding of how the Agulhas Current influences our coastal regions is limited. This is partly because changes in ocean circulation between the Agulhas Current and the coast occur over short space and time scales. This makes it very difficult for scientists to observe, characterise and predict the fine scale variations at the landward edge of the Agulhas Current, which have a strong impact on the shelf and coast. But gliders can help us address some of these observation challenges. Gliders are autonomous robotic platforms which use two-way communications to relay data back to the shore in real time while at the same time receiving instructions from pilots to control their functioning. Gliders provide continuous (multi-month) measurements at high spatial (100's of meters to 3km) and temporal (0.5-4 hourly) resolution. Sensors on gliders measure such physical variables as pressure, temperature, salinity and current, and biological variables relevant to the abundance of phytoplankton and zooplankton, and also ecologically important chemical variables

such as dissolved oxygen, carbon dioxide and nitrate.

GINA builds on the success of the 1st glider experiment in the Agulhas Current region: the Shelf Agulhas Glider Experiment (SAGE, http://socco.org.za/sage/). GINA aims to complement and enhance existing observing networks such as the Agulhas System Climate Array (ASCA) or Coastal monitoring network managed and maintained by the South African Environmental Observation Network (SAEON). The proposed project will serve national development initiatives, such as Operation Phakisa. This work will also provide broader societal impacts through improving our response and mitigation of the effect of climate change on the coastal and shelf marine environment. The proposed observations will form part of the internationally-driven Ocean Gliders Boundary Ocean Observing Network and the research will be shared across a wide range of national and international collaborators.

The GINA working group includes Dr. M. Krug, Dr. Pedro Monteiro, Dr. Bjorn Backeberg (CSIR-NRE), Dr. J. Hermes, Jethan D'Hotman and Dr. Tommy Bornman (SAEON), Dr. Enrico Gennari (Oceans Research), Dr. Sarah Fawcett and Prof. M. Rouault (UCT), Dr. T. Lamont (DEA), Dr. C. van der Lingen, Dr. Janet Coetze and Dr. Stephen Lamberth (DAFF), Dr. Angus Paterson (SAIAB), Dr Sean Fennessy and Dr. Fiona MacKay (ORI), Dr. Sebastiaan Swart (Gothenburg, Sweden).

We appeal to the community to NOT interfere with the two glider platforms shown in Figure 1 and 2 as this would compromise the scientific experiment and might result in the glider platforms and the sensors being damaged. The glider will be monitored 24h a day and 7days a week by a team of pilots at SAMERC (http://socco.org.za/facilities/#Robotics).

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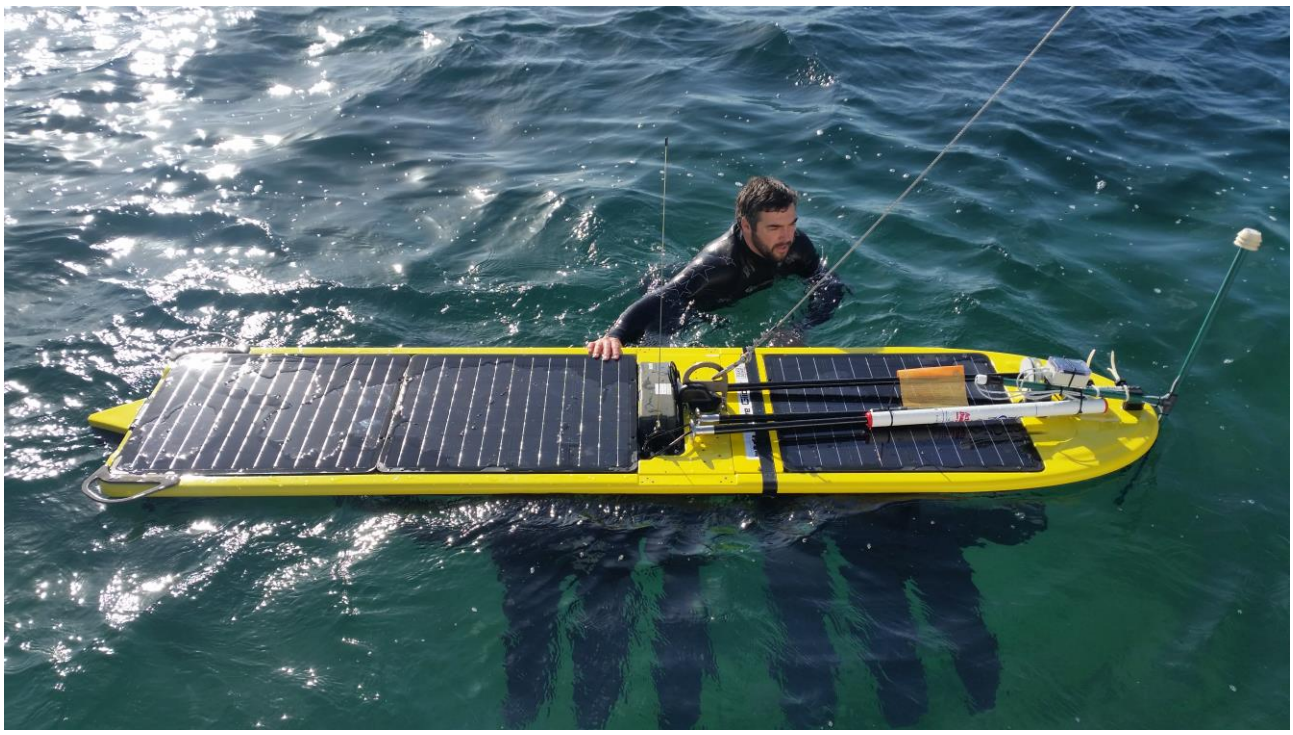

Figure 1: An SV3 Liquid Robotic Waveglider. This platform will be used in the GINA oceanographic experiment between June and August 2017 and will provide continuous observations at the ocean's surface. Should you come across this platform between Richards Bay and Port Elizabeth, please do not interfere with it as it would compromise the GINA project. The glider will be monitored 24h/7day by a team of pilots at SAMERC (http://socco.org.za/facilities/#Robotics).

(a) **(b)**

Figure 2: (a) Dr. Krug with a Seaglider prior to deployment. (b) A Seaglider in the water. This platform will be used in the GINA oceanographic experiment between June and August 2017. The Seaglider will provide vertical profiles of the water column down to water depth of 1000m. Should you come across this platform between Richards Bay and Port Elizabeth, please do not interfere with it as it would compromise the GINA project. The glider will be monitored 24h/7day by a team of pilots at SAMERC (http://socco.org.za/facilities/#Robotics).