Cape Town, South Africa, February 2nd, 2022

**Media Release**


The International Ocean Discovery Program (IODP) drilling cruise to the Agulhas Plateau will investigate the interplay between changes in ocean bathymetry, ocean circulation and global climate. The IODP is an international research program supported by 22 nations, with the goal of exploring Earth's history and structure recorded in seafloor sediments and rocks, and monitoring sub-seafloor environments.

The Agulhas Plateau is a large oceanic plateau that lies approximately 500km south of South Africa. It is hypothesized to be the remains of a large-scale volcanic event that occurred as Gondwana broke up into Antarctica, Africa and South America, which originally formed at, or near, sea-level. The sediments laid down on top of the plateau since its formation, now more than 1km in thickness in places, record the long-term changes in paleo-climate and ocean circulation as the Earth evolved from warm, greenhouse conditions in the Cretaceous to a cooler world with polar ice sheets in the Cenozoic. IODP Expedition 392 “Agulhas Plateau Cretaceous Climate” aims to recover the first ever deep geologic samples from this area in order to both determine origin of the plateau and document evolving ocean connections and climate in the Southwest Indian Ocean over the past ~120 million years. A team of international scientists will leave the port of Cape Town onboard the research drilling vessel *JOIDES Resolution* on 10 Feb 2022, headed for the Agulhas Plateau.

It has been suggested that significant changes in past ocean and atmospheric circulation related to evolving bathymetry in oceanic gateways drove regional and global scale climate change. One such gateway is the Africa – Southern Ocean Gateway that connects the Indian and Atlantic oceans, which opened with the formation of the Agulhas Plateau. However, incomplete sedimentary records from the southern high-latitudes make understanding Earth’s oscillatory cooling transition from the Cretaceous Hothouse (peaking at approximately 90 million years ago [Ma]) to the mid-Cenozoic Icehouse (approximately 33.7 Ma) extremely difficult – and therefore difficult to assess the relationship between climate change and gateway evolution.

The overarching motivation of Expedition 392 is to gather sediments and volcanic rocks from below the seabed to develop a greater understanding of: (1) the origin of the Agulhas Plateau and the timing of its emplacement; (2) the interplay between ocean circulation, the formation of the Agulhas Plateau as an obstruction, and changes in regional and global climate; (3) episodic climate change and the response of high-
latitude marine plankton communities in greenhouse periods of Earth history; and (4) the long-term evolution of climate from the Cretaceous to the Cenozoic.

Scientific drilling of Cretaceous records on the Agulhas Plateau will recover volcanic rocks and sediment samples that provide fundamental insight into the complex interplay between southern African climate evolution, ocean redox, nutrient development and associated organic carbon burial, and multiscale volcanic activity in the young and still small Southern Ocean basin. Its location at a high southern palaeo-latitude makes the Cretaceous archive of the Africa–Southern Ocean gateway a particularly valuable target.

The expedition is conducted by the JOIDES Resolution Science Operator (JRSO) as part of the IODP. While at sea, the JOIDES Resolution can provide personalized ship-to-shore live broadcasts to school, community and museum groups. Interested parties should contact joidesresolution@gmail.com for more information.

BACKGROUND
Science in search of Earth’s secrets
The transition from the Cretaceous “Supergreenhouse” interval, peaking approximately 90 Ma, to the mid-Cenozoic icehouse (~33.7 Ma) provides an opportunity to study changes in Earth system dynamics from a time when climate models suggest CO₂ levels may have ranged from as high as 3500 ppmv (parts per million by volume) to less than 560 ppmv. (As a comparison, the National Oceanic and Atmospheric Administration (NOAA) recorded a peak of 420 ppmv in 2021 at their Mauna Loa observatory). During the Supergreenhouse interval, Southern Hemisphere temperature gradients were very low and oceanic deposition was punctuated by episodes of widespread depletion of dissolved oxygen, termed Oceanic Anoxic Events, resulting in large-scale burial of organic carbon. High CO₂, greenhouse climate conditions are envisioned for the near future, thereby calling for action to get a better understanding of the potential impacts and dynamics of a high CO₂ world.

Lead by Co-Chief scientists Gabriele Uenzelmann-Neben (Alfred Wegener Institute, Germany) and Steven Bohaty (Heidelberg University, Germany), the scientists of Expedition 392 will sail to the Agulhas Plateau and Transkei Basin, targeting five primary sites. These five drill sites, in some places greater than 4,000 m below the sea surface, will sample rocks from layers of lava flows and the sediments lying above them. Studying rocks that span both distance and time enables scientists to better reconstruct the processes that followed the opening of these ocean gateways, and any associated climatic responses.

Dr Uenzelmann-Neben said “This is the first time this early phase of development of this particular gateway, and especially water mass exchange between the Indian, Southern and South Atlantic oceans, will be the target of scientific drilling. And this, in comparison to existing ODP and IODP drill sites from the Kerguelen and Naturaliste plateaus, will significantly advance the understanding of Large Igneous Province formation and the evolution of ocean temperature, circulation, and sedimentation patterns during the Cretaceous.”

Tectonic History of the Africa – Southern Ocean Gateway
During the Early Cretaceous, the Africa – Southern Ocean gateway was closed and the South American, African, and Antarctic continents were connected. Breakup of this region of Gondwana commenced at ~146
Ma and was associated with the formation of two oceanic plateaus: the Mozambique Ridge (~136–120 Ma) and the Agulhas Plateau (105–95 Ma). These seafloor elevations constituted barriers for circulation of deep and intermediate water masses. Ocean processes in the Agulhas Plateau region today have a crucial influence on global climate. At the African-Southern Ocean gateway, warm and salty waters are transported from the Indian Ocean into the southern Atlantic via the Agulhas Current and Agulhas Rings, while cold water flows eastward into the Indian Ocean. Integration of records across the array of drilling sites on the Agulhas Plateau will provide a unique opportunity to monitor surface- and deep-water temperature, nutrient, and circulation changes from the Late Cretaceous through Early Cenozoic in the subantarctic South Atlantic.

The Agulhas Plateau region is key for modern deep-water circulation and surface frontal systems. New drill-core records can answer questions related to the development of the Antarctic Circumpolar Current; the evolution of bottom-water flow from the Antarctic margin into South Atlantic basins; the temperature evolution of subantarctic waters; and the global significance of Antarctic weathering inputs to the oceans.

Dr Bohaty said “Expedition 392 will be the first scientific drilling effort to directly sample the basement rocks of the Agulhas Plateau and the overlying sedimentary strata, thereby providing a unique and unprecedented view into the plateau’s origin and subsequent climate history.”

Expedition 392 will sail with 31 scientists from 11 countries, including 1 observer from South Africa, with expertise in a range of geoscience disciplines. While at sea, the JOIDES Resolution laboratory infrastructure will be utilized for intensive sampling and investigation of the cores retrieved. This includes splitting, describing, and analyzing the cores, which will be made available to non-expedition scientists after a one-year moratorium. Data from these core samples will be used by scientists all over the world.

More information:
About the expedition - IODP JRSO • Expeditions • Agulhas Plateau Cretaceous Climate (tamu.edu)
About the research program - www.iodp.org

Get involved:
Twitter - @TheJR
Instagram - joides_resolution
Facebook - JOIDES Resolution

Contact / Interviews / Images:
Maryalice Yakutchik
Exp 392 Onboard Outreach Officer
Email: thejoidesresolution@gmail.com

Carol Cotterill
Assistant Director, Education and Outreach
US Science Support Program
Email: ccotterill@ldeo.columbia.edu