Antarctica Month – Science Fact Sheet

- What is **SCAR**?

- In broad terms, international scientific activity in Antarctica is initiated, promoted and co-ordinated by the Scientific Committee on Antarctic Research. This body was set up by the International Council of Scientific Unions (ICSU) in September 1957. South Africa is one of the founding members of SCAR.

- What is the role of the Department of Science and Technology?

- The Department of Science and Technology co-ordinates, evaluates and funds SANAP's Antarctic research projects.

- What does South Africa's Antarctic research focus on?

- South Africa's Antarctic research focuses on five main themes covering the geosciences, physical sciences, life sciences, the impact of the human presence in Antarctica and the history, sociology and politics of our long term presence in the region.

- Why does Antarctica offer such a favourable location for the study of the geospace environment and why is this research important?

    1. Also known as the solar terrestrial environment, 'geospace' refers to earth and its interaction with the sun by means of various forms of particles, fields and radiation. The earth is surrounded by a magnetic field, also called the magnetosphere, which is shaped something like an enormous ring donut with the earth at its centre. The magnetic field converges in two cones, intersecting with the earth's surface at the North and South Poles. Antarctica, being a continent, offers a superior platform for research facilities located in these cones (the Arctic has a floating ice-cap, which varies considerably in area and thickness according to the seasons). Turning our attention to the sun, years of research have shown that the sun radiates light, electromagnetic waves and various charged particles. The intensity of this radiation and the quantity of particles varies according to the activity on the sun. This is known as 'solar weather' and follows 11 and 22-year cycles. Most places on earth are shielded from solar activity (other than light) by the magnetosphere but the 'gaps' at the poles result in plasma (ionised gas) being guided by the magnetic field lines into the upper atmosphere. Here they release some of their energy, which

becomes visible as light – in a manner analogous to that in which an image is formed on a television screen. This is known as the aurora (aurora borealis in the Northern Hemisphere, aurora australis in the South). By studying this and related phenomena, we can gain a better understanding of the sun, the magnetosphere and the upper atmosphere, as well as effects on earth. Satellites play a major role in communications, navigation, oceanography, meteorology and other earth sciences – and solar weather can seriously affect our space-based technology. Similarly, the earth's ozone layer shields life on the surface from harmful ultra-violet radiation. 'Holes' in the ozone layer allow this radiation through. The first evidence of significant changes in the ozone layer was detected in Antarctica. Having a window on geospace can thus have very down-to-earth benefits!

- Why study Antarctic geology?

- Thanks to Antarctica's geological formation, it offers an excellent insight into the evolution of the earth's crust over a period spanning almost 3 billion years. Geological studies can reveal a wealth of information concerning climate fluctuations during this period – which in turn can be used to understand and benchmark present and future climate variability.

- What about biodiversity?

2. Biodiversity (the presence of a greater or lesser variety of life forms in a particular environment) can be a significant indicator of the state of health of the environment. Many factors can influence biodiversity, including natural cycles and changes, the introduction of invader species and the impact of human presence and activity. These factors can also interact with one another. By carefully integrating the work of oceanographers, biologists and geoscientists in Antarctica, the Southern Ocean and sub-Antarctic islands (such as Marion and Gough), a more complete picture of biodiversity in these regions can be developed, which in turn can offer indications of the effects of global climate change.

- What are some of the current research programmes?

3. The **SHARE** (Southern Hemisphere Auroral Radar Experiment) at SANAE IV forms part of the international Super DARN programme. This programme has conducted valuable research on the magnetosphere and ionosphere, providing data for space weather forecasting. In 1998 the SuperDARN programme received a NASA award in recognition of its work in the field of geospace research.
4. The **AMIGO** (Antarctic Magnetospheric and Ionospheric Ground-based Observations) programme is operated at SANAE IV by the North-West University and the University of KwaZulu-Natal.

5. **ANOKS** (Antarktiese Navorsing oor Kosmiese Strale = Antarctic Research about Cosmic Radiation) studies the energy spectrum of cosmic rays using a neutron monitor at SANAE IV.

- What biological research is conducted at the Prince Edward Islands?
- There are four key themes:
    1. The interactions between marine (sea) and terrestrial (land) systems
    2. The life histories of seals, birds and orcas (Killer Whales)
    3. The structure and functioning of terrestrial ecosystems
    4. The structure and functioning of the near-shore ecosystems.

    This research has led to an unparalleled knowledge of the biodiversity of the Prince Edward Islands.

- What biological research is conducted at Gough Island?
- Key fields of study at Gough Island include:
    1. The impact of fisheries on the seabirds that are indigenous and endemic to the islands
    2. The impact of invasive species (mainly mice) on birds nesting on the islands.

    An investigation into the terrestrial biodiversity of the island revealed that there are 71 species of introduced insects but only a third as many indigenous ones.

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