THEMATIC AREA 1

ANTARCTIC ATMOSPHERE AND ENVIRONMENTAL IMPACTS IN SOUTH AMERICA

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Introduction

The monitoring of the Antarctic atmosphere and its influence on South America is being built using solid foundations from the studies that for decades have been undertaken by Brazilian researchers in the Antarctic region. The proposal is to continue these studies, which require long term series of data for a greater understanding and monitoring of environmental changes. The information obtained also offers support to numerical models of weather and climate forecasts, which can thus become more reliable. In all, the research already undertaken and presently underway represents more than two decades of continuous research of the influence of cold fronts from the Antarctic on Brazilian climate, monitoring of the ozone hole, variation of UV radiation and other highly relevant studies.

The monitoring of the impacts of solar phenomena in the Antarctic atmosphere is designed to identify the contribution of activity and changes in the medium and long term (solar cycle) in the upper atmosphere. Thus we can establish the connection between changes in the interplanetary medium and the terrestrial climate, considering the sociological and coupling of the various layers of the atmosphere.

The observations of chemical emissions on top of the Antarctic mesosphere (80-100 km altitude) are used in studies of the dynamics of atmospheric waves that propagate toward the upper atmosphere. Accompanying these movements will allow greater understanding of the effects of the Antarctic polar vortex and the transport of energy into the upper atmosphere. This issue stands out as one of the main topics in understanding the processes responsible for global climate variations.

The increase in greenhouse gases (carbon dioxide, methane, etc.), at the bottom of the atmosphere (up to 30 km altitude) can cause a drop in temperature of the mesosphere between the 80 and 90 km altitude. The decline in the concentration of the ozone layer causes the temperature of the stratosphere (between the 15 and 50 km area) to decrease. Thus temperature measurement is an important parameter to monitor changes on the long term.

A new issue has arisen with the temperature change in the region of the ozone layer. What will happen to the connection between the layers and the equilibrium with the lowering of the temperature of the upper atmosphere and increased temperature on the ground? The variations of temperature and UV radiation will produce changes in both the chemistry and the dynamics of the layers of the atmosphere.

The atmospheric aerosols play an important role in global radiation balance and their importance on the sub-Antarctic is not yet completely understood. The Antarctic Peninsula region is strongly influenced by different sources of aerosols, such as aerosols of marine origin due to the high primary productivity of ocean regions adjacent to the Patagonian desert dust, volcanic activity of the southern Andes and long distance transport from urban areas and forest fires in South America. For this reason, there is the intention to simultaneously monitor aerosols in two seasons in Patagonia (Punta Arenas) and King George Island. Furthermore, the effect of local anthropogenic pollution resulting from human settlement areas in the Antarctic region as well as the contribution of bio-aerosols is still unknown. Thus, monitoring of aerosols will have two purposes: to diagnose the impact of local human presence,

model the dynamics of plumes of pollutants from local sources, and investigate the long-distance transport, with emphasis on the influence on South America.

Goals

Monitor and evaluate

- The region where cold fronts move toward Brazil and the respective changes and variations to the climate;
- The greenhouse effect seen in Antarctica;
- Changes in chemistry and physics of the atmosphere and its influence on climate, involving: the interaction Sun-Earth, the temperature in the mesosphere and the region of the ozone layer, especially during the occurrence of the "hole in the ozone layer."
- The impact of solar radiation on the environment.
- Modelling the spatial atmospheric impact due to local sources to study the atmospheric transport between South America and Antarctic Peninsula.

Offer subsidies to numerical models of weather and climate

Over the past 65 years, average annual air temperatures in Admiralty Bay show an *average warming of +0.23 °C. However, one must consider that in this region* climatological measurements were only standardized in the last 30 years

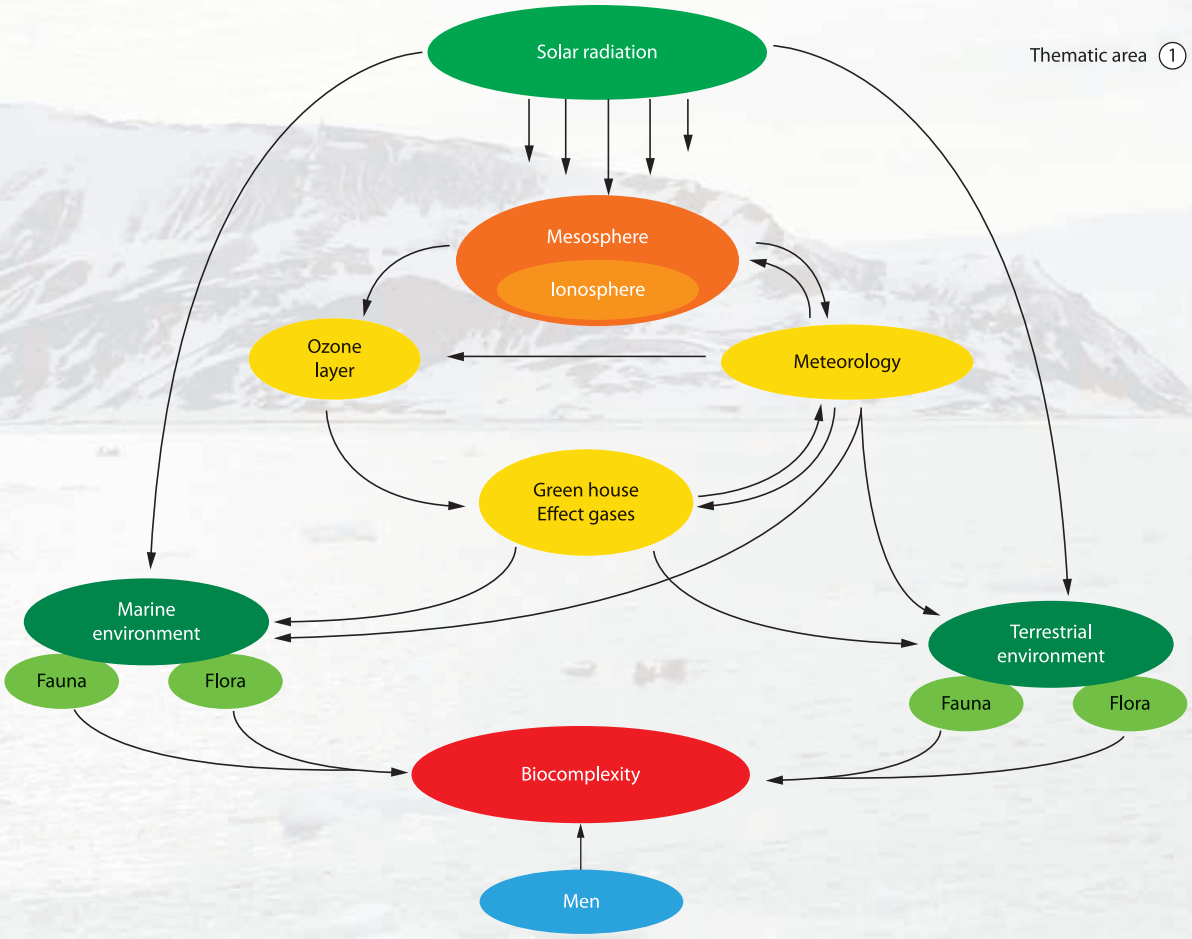

Figure 1. Thematic Area 1 flowchart. (Illustration: Edson Rodrigues).