

# SOUTHERN AFRICAN WEATHER AND CLIMATE: THE PRESENT AND THE FUTURE

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Dr Lindesay split her presentation into four main parts:

- General Weather Systems
- El Niño Events
- Global change and the Safari Project
- The future weather and model predictions

## General Weather

The weather patterns in the southern hemisphere are complex and many factors are involved. For the southern African area, the weather is controlled by the intertropical convergence zone to the north over the tropics, the normal high pressure zone over South Africa and the westerly wind systems to the south of the continent. Frontal systems move up from the southern oceans and interact with the high over the country and the intertropical convergence to the north. These interactions are influenced by the two ocean currents running along the coasts. To the east the warm Agulhas current runs north to south and along the west coast the cold Benguela current runs south to north. These currents have a significant effect on the coastal climates. In the east the coastal climate is normally wet during the summer, along the west coast the climate is very dry.

The interactions of these local systems give rise to a great variation in rainfall even in normal seasons. Superimposed over these local conditions are the global effects of events such as the El Niño (warm water in the Pacific) and La Nina (cool).

## El Niño

Across the south Pacific and Indian oceans there are two predominant areas of pressure variations. In the Indonesian region there is a normal extensive area of low pressure. To the east of this stretching from the central Pacific to south America is normally a high pressure system. The differences in the pressures causes the normal pattern of south-easterly trade winds to blow. This can then bring moist air into the local weather system in this region. Periodically the high pressure areas in the southern Pacific, experience the development of a warm water pool and general sea temperatures rise. This upwelling and movement of warm water towards the South American west coast occurs around Christmas. The warming reduces the air pressures. The wind systems and patterns become weaker and do not then drive the moist warm air over the Indian ocean towards the southern African coast. These changes have world wide influences giving rise to severe droughts in some areas and floods in others.

Australia, southern Africa and eastern South America all experienced major droughts while parts of Asia, western South America, west north America and parts of Europe all have heavier than normal rains.

One measure of the magnitude of the El Niño effect is given by comparing pressure and temperature levels at Darwin on the northern coast of Australia with those at Tahiti. The values are expressed as the Southern Oscillation Index (SOI) and gives a measure of the strength of the existing El Niño phenomenon.

The current one which has been in place since 1992 was slowly decaying over the December 1992, January 1993 period but for the last three months the change back to normal slowed down. The latest measures indicate that the pressures are back to near normal and that any lack of rain may now be due to the normal weather generating systems rather than to global effects.

## Warming

Global warming is a major topic of concern to everybody. The mechanics of the process and the real state of global warming is not too clear even with the sophisticated equipment available.

Increases in carbon dioxide, carbon monoxide and all the other greenhouse gases and particulate material seems to be accelerating. The contribution that biomass burning plays in this process is being studied in the southern African area by the Southern African Fire Atmosphere Research Initiative (SAFARI). This is a co-operative project between NASA, the Max Planck Institute, and local University and research groups. The effect of global warming will be an increase in sea level and a shift in some weather patterns. These could be associated with an increase in rainfall in the Natal coastal region, although it is difficult to develop rainfall scenarios.

## Future and models

The major global scale weather models still do not predict accurately the future weather or global warming. They do however give some indication of the expected increase and decrease in major weather system drivers so that the probability of an expected event happening can be rated. The availability of global data from satellites has increased dramatically and there is no doubt that forecasting is improving. The best use for the major models is probably to set the framework so that local weather models can work within the larger framework.