a) Water vapor transports over Argentina: observations and reanalysis
b) Downscaling experiments at CIMA.

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The presentation was divided in two main topics. The first one is related with circulation and water transport in the southern South America, and the second part of the presentation is related with some previous downscaling results obtained at CIMA.

Circulation and moisture transport results in the southern part of South America come from previous studies of Fernández, A. and Nuñez, M.

In this study, the global reanalyses produced by the European Centre for Medium Weather Range Forecasting (ECMWF) known as ERA Reanalyses and regional upper data from the Servicio Meteorológico Nacional of Argentina (SMN), were used for the periods 1953 -1983 (SMN) and 1979 - 1983 (ERA).

Seasonal and monthly averages of moisture fluxes and moisture flux transports are presented and reanalyses and observational data are compared. A discussion of seasonal, monthly and transient features of fields relevant to the vapor exchanges between tropics and mid-latitudes is now presented. The intention is to identify key regions where the major exchanges could occur and to discuss the value of the reanalyses in comparison with observational data. In the present summary vertically integrated vapor flux fields are disscussed.

The January 850 - 400 hPa vertically integrated vapor flux fields using ERA and SMN data are shown in Figure 1. As we can see in the figure to the right (ERA), region related to major humidity transport are linked to the Chaco low and the SACZ. Dry air is introduced to the north while moist air is advected southward on the East Side of the mountains. Also, the flow from the north concentrates in a narrow region east of the Andes, extending to southeastward into the South Atlantic Ocean approximately at 40º S and 60º W. In the SMN data map, the Northerly flow at the eastern side shows two regions of maximum intensity. The first (400 $gr.cm^{-1}.sec^{-1}$) is located approximately at 26º S and 59º W and is relate to the SACZ. The second maximum is found at the East Side of the Andes approximately at 39º S and 69º W. To the South of 43º S the flow is from the North. Northerly flow is also found at the Santa Rosa location (approximately at 36º S and 64º W). Regarding the maximum values in the Northerly flow, there is a good agreement between the ERA and SMN data. The SMN data is not showing Northerly flow extending to southeastward into the South Atlantic Ocean approximately at 40º S and 60º W, as it can see at the ERA data.

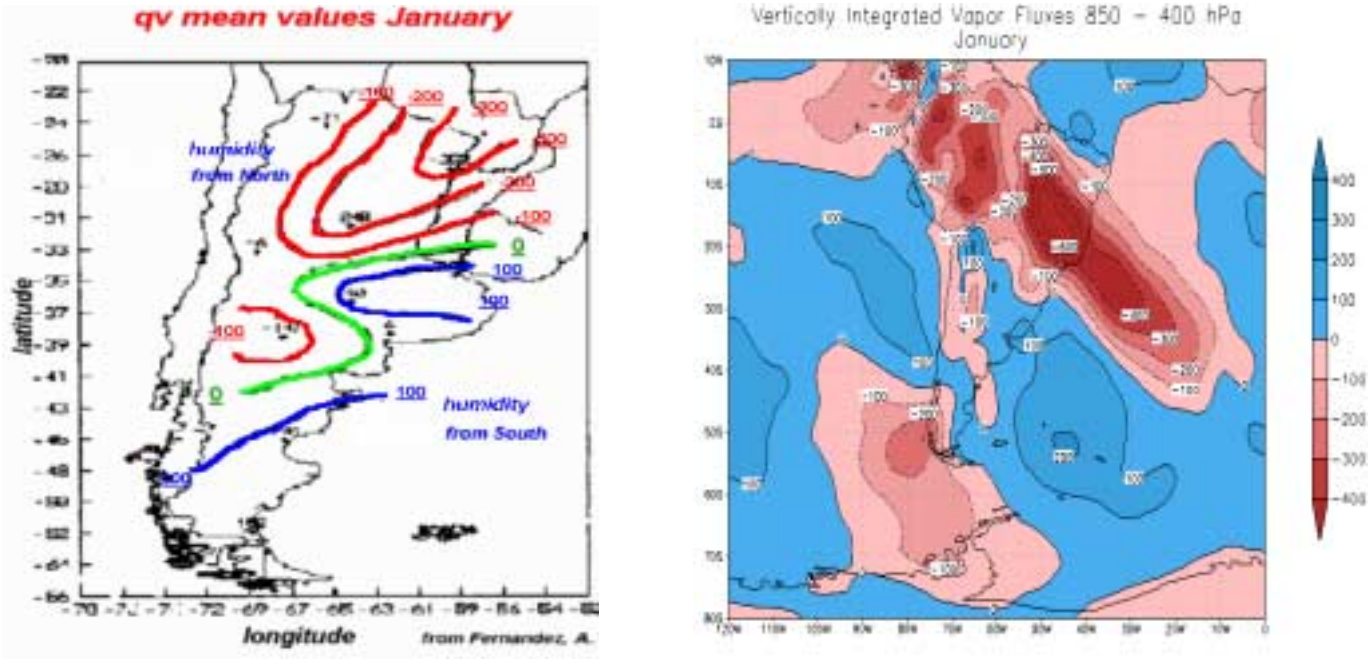

Figure 1. January 850 - 400 hPa vertically integrated vapor flux using SMN data (Right). Red (blue) lines represent Southerly (Northerly) transport. Idem with ERA data (Left). Red (blue) areas represent southerly (Northerly) transport.

Downscaling experiment results come from previous studies of Menéndez, C., Nuñez, M., Saulo, C. and Solman, S.

Statistical downscaling approach: With the purpose of assessing the vulnerability of crop production in Argentina related to the impact of global warming we estimated local changes of monthly mean precipitation for summer and winter months caused by CO_2 doubling, at selected stations lying in central Argentina. A statistical downscaling approach was developed by means of empirical relationships between large-scale climatic variables from the NCEP re-analyses data set and local scale precipitation data. The method was tested against an independent set of observed data and subsequently applied to the Max Plank Institute (MPI) GCM control run. Despite the simplicity of the statistical approach developed, it was able to satisfactorily reproduce the spatial patterns of the regional precipitation field. The response of the climate system to the enhanced emission scenario simulated by the MPI model was used to infer the local climate change. The MPI model for the increased CO2 scenario simulates a precipitation decrease over the region of interest. Accordingly with the GCM potential changes, the local precipitation decrease is higher in summer than in winter. This result involves an important consequence in the rainfall regime over the region, due to a higher decrease of rainfall is projected for the rainy season while a weaker decrease is projected for the dry season. Regional scenarios of climate change, including both rainfall and

extreme temperatures were used to assess the impact of climate change on crops (wheat, maize, sunflower and soybean) and pastures production in the Pampas region in order to evaluate the vulnerability of the system to global warming. Figure 2 display the annual variation of area mean precipitation for the Argentinean Humid Pampas region in the case of an enhanced emission scenario simulated by the MPI model, due to double CO_2 emission.

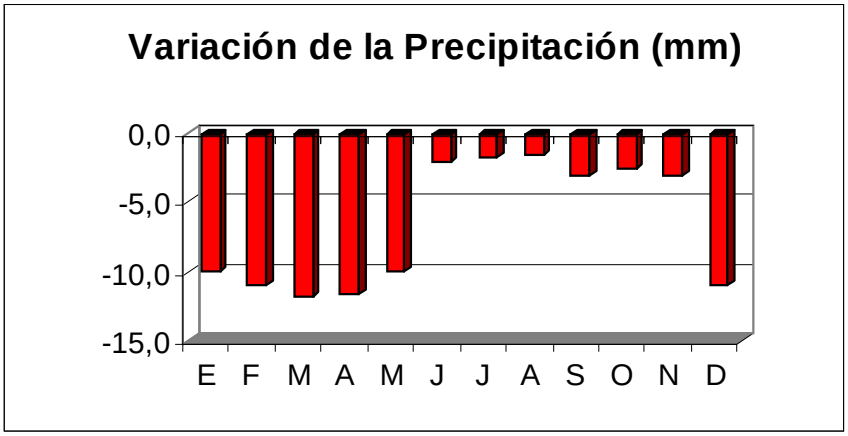

Figure 2. Annual variation of area mean precipitation for the Argentinean Pampas Region, in case of an enhanced emission scenario.

Regarding dynamical downscaling approach nested models experiments are carrying on at CIMA at the present time.

The current coarse resolution of general circulation models (GCMs) does not provide reliable estimates of precipitation and other variables at the appropriate scales required for regional climate studies over the South American region. To overcome this problem, one possibility is to perform regional climate simulations using limited-area models nested in global models. A research effort aimed at the development of this downscaling technique for the eastern South Pacific-South America-western South Atlantic region is nowadays under way at the Centro de Investigaciones del Mar y la Atmósfera (CIMA), Buenos Aires. The technique consists of using the output of GCM simulations to provide driving initial and time-dependent lateral boundary conditions for regional climate model (RCM) simulations over South America and adjacent oceans (one way nesting). The singularity of this nesting system is that the global model itself has a variable horizontal resolution stretched grid irregularly spaced in the meridional direction. This stretched grid is introduced in order to improve resolution in a latitudinal band over the region of interest. This pilot study introduces an initial diagnosis of the capabilities of the RCM for simulating climate in the South American region. Our preliminary results suggest that nesting technique is a computationally low-cost alternative suitable to simulate regional climate features. However, before applying

this nesting system to problems involving the local response to climate change, additional simulations, parameterizations tuning and further diagnosis are clearly needed to represent regional patterns more precisely.