# VAMOS Program

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The Variability of American Monsoon Systems (VAMOS), one of CLIVAR's Principal Research Areas, focuses on the complex issues raised by the need for better understanding and prediction of the second largest monsoon system on Earth.

The goal of VAMOS in the Americas is to improve the

1) understanding of the monsoons in the context of the global climate system,
2) capacity for seasonal to interannual climate predictions, and
3) assessment of anthropogenic climate change impacts.

The VAMOS Panel's strategy to achieve these goals is based on the

1) identification of scientifically important climate phenomena with demonstrated potential for predictable components,
2) encouragement of partnerships between scientists in interested countries and contributions to the development of national and international research plans, and
3) promotion of broad participation in field programmes, both to bring local expertise to an international setting and to enhance scientific exchange and capacity building.

The Panel has focused on the definition of key problems within the framework of VAMOS goals, and on the formulation of hypotheses for guidance of future empirical and modelling research as well as on the design of field experiments. A unifying view has started to emerge as similarities and differences between North and South American monsoon systems have been further clarified.

The current plans are centered on two internationally coordinated efforts to improve prediction of warm season precipitation over South and North America:

a) Monsoon Experiment South America (MESA), and
b) North American Monsoon Experiment (NAME).

The principal objectives of MESA and NAME are

1) a better understanding of the key components of the American monsoon systems and their variability,
2) a better understanding of the role of those systems in the global water cycle,
3) improved observational data sets, and

4) improved simulation and monthly-to-seasonal prediction of the monsoon and regional water resources.

About MESA: Over South America, the summer circulation is dominated by the monsoon system. Important geographical factors determining the evolution of this system are the large land mass bisected by the equator, very high mountains to the west that effectively block air transport in the zonal direction, and surface cover that varies from tropical forests in Amazonia to high altitude deserts in the Bolivian Altiplano. Plentiful moisture supply from the Atlantic maintains a precipitation maximum over central Brazil. A major seasonal feature of the monsoonal circulation over South America is the South Atlantic Convergence Zone along the north-eastern boundary of the La Plata Basin. An important component of MESA's Stage 1 focuses on the South American Low-Level Jet (SALLJ) and the moisture corridor between the Andes and the Brazilian Altiplano. The main objective of this component is to better understand the role of the SALLJ on the moisture transports, their variability and links to remote and local climate anomalies and it is also part of the VAMOS/ALLS Program.

***What is the ALLS program?***

Review of observed climate variability, regional hydrology, and high impact weather over the Americas points to a prominent gap in past monitoring of low-level atmospheric jets. These circulations promote exchange of atmospheric water vapor from low to mid-latitudes and its subsequent condensation. They modulate spring and summer rainfall events over the Mississippi and La Plata river basins and exert controlling influences for droughts, floods, and severe weather. Broad, agriculturally productive river basins of North and South America are naturally irrigated by moisture that is transported by low level jets (LLJ) and precipitated downwind of their speed maxima. Organization of American droughts, floods, and severe weather over these American bread-baskets is often modulated by these narrow LLJs characterized by cross-stream scale of several hundred km and synoptic to continental streamwise dimensions. LLJ variations occur on all time scales, with regular diurnal fluctuations featuring nocturnal maxima.

Low -frequency variability from the intra-seasonal to the interdecadal has been shown to modulate LLJs suggesting the predictive potential of these orographically bound currents. Realization of this potential requires identification of the source of this variability both with respect to remote influences and regional forcings. The American Low-Level Jets (ALLS) program will promote improved climate prediction with emphasis on forecast model components related to surface moisture sources, atmospheric moisture transport and regional precipitation modulation.

Operational observing systems do not resolve LLJs over either American continent. Modern data assimilations consequently contain monthly averaged moisture flux uncertainties on the order of 50% over large river basins of the Americas, and related diurnal precipitation

cycles are seriously distorted in global data assimilations. The uncertainties are due directly to inadequate resolution of LLJs by operational observing systems.

Portions of the broad LLJ spectrum are potentially predictable manifestations of interaction of ambient circulations with orography, soil moisture, and sea surface temperature. The diurnal cycle should be particularly predictable because it is so regular. Atmospheric scientists do not understand why GCM simulations of related phenomena such as nocturnal precipitation and wind maxima are so poor, and will not remedy this deficiency until sufficient observations are available to calibrate model simulations of the full diurnal cycle.

During the past half decade, special asynchronous observations have started to fill observation voids over North America, and field experiments over South America have started to fill gaps of LLJ observations there. The intent of the ALLS program is to promote and extend these efforts so that accurate, averaged moisture fluxes can be obtained over the larger river basins of North and South America allowing evaluation of gridded data sets used in empirical studies and calibration of climate and regional models at both short and long time scales.

## About VAMOS and PROSUR:

In the VAMOS Panel Meeting held in Montevideo between 26 ad 30 March, 2001, the panel recognized that PROSUR is already very much contributing to further the goals of VAMOS and it declared PROSUR as a VAMOS affiliate project. Carolina Vera, member of the VAMOS panel, was nominated to represent PROSUR at VAMOS Panel meetings.

## Sites about VAMOS:

VAMOS web site: **http://www.clivar.org/organization/vamos/index.htm**
ALLS implementation plan: **http://www.met.utah.edu/jnpaegle/research/ALLS.html**
SALLJ Conference: **http://www-cima.at.fcen.uba.ar/sallj/**
Exchanges special issue featuring VAMOS:
**http://www.clivar.org/publications/exchanges/ex16/exchv5n2p1.htm**