Met. [illegible] 1994

(1)

UNIVERSIDAD DE BUENOS AIRES
FACULTAD DE CIENCIAS EXACTAS Y NATURALES

DEPARTAMENTO: Ciencias de la Atmósfera
CARRERA: Posgrado y Doctorado
CUATRIMESTRE: Segundo AÑO: 1994
CODIGO DE CARRERA N°: 56

MATERIA: Aspectos de la Circulación Atmosférica del Hemisferio Sur CODIGO N°: --
PUNTAJE PROPUESTO: 2 puntos
PLAN DE ESTUDIO AÑO: --
CARACTER DE LA MATERIA: Optativa, de posgrado y doctorado
DURACION: 6 semanas

HORAS DE CLASE SEMANAL: Teóricas:
Problemas:
Laboratorio:
Total de horas: 4
Seminarios:
Teórico-problemas: 4
Teórico-prácticas:

CARGA HORARIA TOTAL: 24
ASIGNATURAS CORRELATIVAS: No tiene
FORMA DE EVALUACION: Examen final

PROGRAMA ANALITICO

1. The 12 month component of the annual cycle.
The annual range of the temperature in the ocean surface and in the troposphere increases from equatorial to sub-tropical latitudes and decreases from subtropical to subpolar latitudes. This is characteristic of an ocean hemisphere.
The decreasing annual range south of the subtropics can be explained by the effect on the incoming radiation of the higher cloudiness in middle than in subtropical latitudes-combined with the mixing in the ocean by the stronger winds and ocean currents at middle latitudes.
This distribution of the annual temperature range leads to stronger thermal winds, and stronger westerlies in summer than in winter between 45°S and 60°S.

2. The 6 month component of the annual cycle (semi-annual oscillation-SAO).
The SAO is an intrinsic component of the annual cycle in middle and high latitudes on the Southern Hemisphere. It is related to the different response of the oceanic middle latitudes and the continental polar latitudes to the heat balance at the surface. The amplitude of the SAO in the pressure reaches a peak at 45°S-50°S in each of the three oceans it has a minimun wear 60°S and another peak on the coast of Antarctica. The phase change results in maximum pressure gradients at 55°S-60°S in spring and autumn and thus to a double wave in the wind and wind stress. North of 50°S the SAO in the wind reverses its phase.

3. A modulation of the annual cycle
The semi-annual component of the annual cycle in the troposphere weakened after the late 1970s, mailing because of changes in winter and spring. A results was that the polar vortex in the troposphere, which normally weakens after its second peak in September-October,

APROBADO POR RESOLUCION CD 700/85

remained strong in November and the breakdown of the vortex in the lower stratosphere was similarly delayed. The delayed breakdown of the polar vortex was coincident with the beginning of the ozone deficit in spring. This points to a dynamical influence on ozone amounts.

4. The cuasi-stationary waves (QSW)
On the Southern Hemisphere the QSW in middle latitudes are almost barotropic and therefore transport almost no sensible heat toward the pole. The QSW on the Northern Hemisphere are baroclinic and there exists a strong association in winter between their transport of sensible heat, latitudinal temperature, gradient, wind, storm tracks, and the flux of sensible heat in the transient waves. All these connections lack on the Southern Hemisphere. The barotroic nature of the QSW on the Southern Hemisphere is due to the lack of land in middle latitudes.

5. Mechanisms of climate variability
There are several mechanisms of climate variability. The one described in this lecture has been respousible for much of the variability on the Northern Hemisphere in winter, It is associated with the capability of the quasi-stationary long waves on the Northern Hemisphere to transport sensible heat poleward during the colder part of the year:
When the transport is strong the baroclinity increases at lower latitudes and the stormtracks move south. The temperature falls in the arctic and over large areas in lower latitudes where the storminess has increased. The temperature trend of the hemisphere is thus negative. The opposite occurs when the poleward transport of sensible heat by the quasi-stationary waves decreases.

6. Time scales of climate variability in the North Atlantic area.
Significant low-frequency fluctuations have occurred in the North Atlantic area over the past two centuries; but the time series of pressure and temperature show significant non-stationary behavior. Two frequency bands are favored: 6-9 years and 2-25 years, but the variances explained by those frequency bands vary considerably with time. This is important to keep in mind when evaluating the importance of climate oscillations which occur over specific frequency bands in a given sub-period.

7. The Southern Oscillation on the Southern Hemisphere.
The development of the two extremes in the Southern Oscillation is closely tied to the conditions in the sea and air over the South Pacific convergence zone. The SO has most spectral power in frequency bands between 3 and 6 years, but it is superposed on a higher frequency typically between 2 and 3 years. This higher frequency is due to a modulation of the South Pacific convergence zone by the temperature level of the sea surface temperature in the area where the convergence zone is situated during the southern summer months.

BIBLIOGRAFIA

1. Van Loon, J. Atmosph. Sci., 1967, (24) 472-486.

2. Van Loon and Williams, 1976, Mon. Wea. Rew. (104) 365-380.

3. Van Loon, 1972. Mon. Wea. Rev. 9105), 636-647.

4. Van Loon, 1983. Proceedings of 1st SoHem Conference, Long Waves. 77-84.

Fecha..........

H. van Loon
....
Firma Profesor

....
Firma Director

Dr. VICENTE R. BARROS
DIRECTOR
CIENCIAS DE LA ATMÓSFERA

....
Aclaración

....
Aclaración