

UNIVERSIDAD DE BUENOS AIRES
 FACULTAD DE CIENCIAS EXACTAS Y NATURALES
 Departamento de Ciencias de la Atmósfera y los Océanos

CARRERA: Ciencias de la Atmósfera, Oceanografía física, Física.

PLAN DE ESTUDIO AÑO:

CUATRIMESTRE: 1er

CODIGO DE CARRERA: 56

MATERIA: Short Course on Convectively Coupled Equatorial Waves and their Scale Interactions

CARACTER DE LA MATERIA: Optativa de posgrado y doctorado

PUNTAJE PROPUESTO: 2

DURACION: 4 Semanas

HORAS DE CLASE SEMANAL:	Teóricas: 6	Seminarios 6
	Problemas:	Teórico-problemas:
	Laboratorio:	Práctico:
	TOTAL DE HORAS:	

CARGA HORARIA TOTAL: 48 horas

ASIGNATURAS CORRELATIVAS: Circulación General de la Atmósfera, Circulación General

FORMA DE EVALUACION: Presentación de una monografía, Final Oral.

El curso se dictará en Inglés y se basará en los siguientes puntos temáticos:

Lecture 1: Linear Techniques for Isolating the Structure of Atmospheric Disturbances Coupled to Convection

Lecture 2: Introduction to Equatorial Waves: Space-Time Spectral Analysis and the Dynamical Structures of Equatorial Disturbances

Lecture 3: Detailed Analysis of Equatorial waves over South America, Africa and the Pacific and Atlantic ITCZ

Lecture 4: Scale Interactions in the Asian, Australian, and South American Monsoon, Ocean-Atmosphere Coupling, and the El Niño/Southern Oscillation

Outline of the Lectures:

Lecture 1: Linear Techniques for Isolating the Structure of Atmospheric Disturbances Coupled to Convection

This lecture will first cover simple time-domain filtering techniques designed to isolate disturbances by their dominant frequencies, then review several approaches for establishing the preferred dynamical structures associated with those disturbances, including EOF analysis, compositing and regression. Regression analysis will be the primary focus since much of the material in later lectures will be based on this approach. Examples will concern tropical-extratropical interactions within the Pacific and Atlantic ITCZ. The use of regressed fields for the determination of momentum and

vorticity budgets will be discussed, and the use of E Vectors to represent Rossby wave activity will be used as an example.

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Lecture 2: Introduction to Equatorial Waves: Space-Time Spectral Analysis and the Dynamical Structures of Equatorial Disturbances

The space-time spectral analysis approach for identifying signatures in equatorial waves will be discussed first. Filtering of satellite cloudiness and dynamical fields from reanalysis will then be covered, followed by a description of the regression technique applied to filtered fields as it is used to determine the preferred dynamical structure of various equatorial disturbances. This discussion will focus on Kelvin, mixed Rossby-gravity, equatorial Rossby, and westward inertio-gravity waves, along with the Madden-Julian Oscillation (MJO). The similarities in the structure of these waves across scales all the way down to mesoscale systems will be emphasized, and the behavior of equatorial waves in a variety of General Circulation Models will be presented and compared with observations.

Lecture 3: Detailed Analysis of Equatorial waves over South America, Africa and the Pacific and Atlantic ITCZ.

Analysis of the dynamics of inertio-gravity (or "two-day") waves over the Pacific warm pool is covered, through the use of a simple linear primitive equation model. Along with an estimate of the diabatic heating source, this approach enables us to establish the so-called "gross moist stability" associated with the waves, which in turn explains the apparent scaling of the waves on the space-time frequency spectra seen in Lecture 1. The structure of Kelvin and easterly waves over the Pacific, Atlantic, South America, and Africa is treated next. Details of the dynamical relationship between easterly waves and convection over Africa is covered using Q Vectors and a linear primitive equation model. The strong resemblance between the structures of observed easterly waves and the leading normal modes of the basic state flow over Africa in the model is demonstrated, which suggests that African easterly waves originate as instabilities in the baroclinic zone of the African easterly jet.

Lecture 4: Scale Interactions in the Asian, Australian, and South American Monsoon, Ocean-Atmosphere Coupling, and the El Niño/Southern Oscillation

The onset of the Asian and Australian monsoon is linked to MJO and Kelvin wave activity through composite analysis, and intraseasonal variability in monsoon activity over these regions and in South America is then discussed. Modulation of higher frequency disturbances by the MJO and the El Niño/Southern Oscillation is treated statistically, along with the impact of equatorial waves on sea surface temperature and oceanic Kelvin waves. Extratropical forcing of atmospheric Kelvin waves over the Pacific and Atlantic is discussed next, along with their impacts over South America and Africa. Finally, the events during the demise of the 1998 El Niño are used as example of multiple scale interactions between Kelvin waves, the Asian monsoon, and the demise of the strong 1998 El Niño event through oceanic forcing by the MJO.

BIBLIOGRAFÍA

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Flatau, M.K., P.J. Flatau, J. Schmidt, and G.N. Kiladis, 2003: Delayed onset of the 2002 Indian monsoon. *Geophys. Res. Lett.*, 30, (14), 1768, doi:10.1029/2003GL017434.

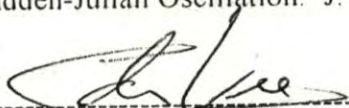
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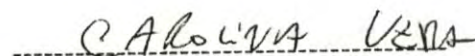
Kiladis, G.N., K.H. Straub, and P.T. Haertel, 2005: Zonal and vertical structure of the Madden-Julian Oscillation. *J. Atmos. Sci.*, 62, 2790-2809.



Firma Profesor



Firma Director



Aclaración

Aclaración

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Universidad de Buenos Aires
Facultad de Ciencias Exactas y Naturales

Planilla a completar para presentación de Cursos de Postgrado

1.- DEPARTAMENTO: CIENCIAS DE LA ATMÓSFERA Y LOS OCÉANOS

2.- NOMBRE DEL CURSO: "Short Course on Convectively Coupled Equatorial Waves and their Scale Interactions"

3.- DOCENTES:

RESPONSABLE/S: Dr. George Kiladis -Dra. Carolina Vera
COLABORADORES:
AUXILIARES:

4.- CARRERA de DOCTORADO y/o POSGRADO./EXTENSIÓN: Carrera de Doctorado y/o Postgrado en Ciencias de la Atmósfera, Oceanografía Física

5.- AÑO: 2006

CUATRIMESTRE/S: Iro.

6.- PUNTAJE PROPUESTO PARA CARRERA DE DOCTORADO: 2

7.- DURACIÓN (anual, cuatrimestral, bimestral u otra): otra

8.- CARGA HORARIA SEMANAL:

Teóricas:..... 24 hs
Problemas:.....
Laboratorio:.....
Seminarios:..... 24 hs
Teórico - Práctico:....
Salida a Campo:.....

9.- CARGA HORARIA TOTAL: 48 hs

10.- FORMA DE EVALUACIÓN: Presentación de una monografía - Final Oral

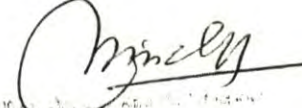
11.- PROGRAMA ANALÍTICO (adjuntarlo).

12.- BIBLIOGRAFÍA (indicar título del libro, autor, editorial y año de publicación):
Incluida en el Programa analítico.

13.- ARANCEL: 20 módulos.

Se adjunta el CV del Dr. George Kiladis de NOAA/AOL, Estados Unidos.


Por Subcomisión de Doctorado


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