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UNIVERSIDAD DE BUENOS AIRES

FACULTAD DE CIENCIAS EXACTAS Y NATURALES

DEPARTAMENTO DE GEOLOGÍA

Carrera: **Licenciatura en Ciencias Geológicas** — Código de la carrera: 04
Carrera: **Doctorado en Ciencias Geológicas** — Código de la carrera: 54
Carrera: — Código de la materia:

CURSO: TECTÓNICA EXTENSIONAL CONTINENTAL

Carácter:

		Puntaje:	
Curso obligatorio de licenciatura (plan 1993).....	NO		
Curso optativo de licenciatura (plan 1993).....	NO	-	puntos
Curso de posgrado	SI	1	puntos
Seminario...	NO	-	puntos

Duración de la materia:
Frecuencia en que se dicta: **Primera vez**
Cuatrimestre en que se dicta: **2do.**

Horas de clases:

teóricas.....	**20 Hs**
prácticos.....	**20 Hs**
problemas.....	**-- Hs**
laboratorios.....	--
seminarios.....	**5 Hs**
Carga horaria semanal.....	**45 Hs**
Carga horaria total	**45 Hs**

Asignaturas Correlativas:

Forma de evaluación: **Para Doctorados: Un Examen Final.**
Ó/ Asistencia sin evaluación y presentación de casos en forma oral.

Docente/s a cargo: **Dra. Silvia Barredo**
Acompañantes: Dras. Giambiagi, Martínez, Tunik

Fecha: / /

Firma.....

Aclaración BARREDA

UNIVERSIDAD DE BUENOS AIRES

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Para cursos que se dictan por primera vez o cuando se introducen modificaciones al programa o a la modalidad de dictado o a la modalidad de evaluación o no pasaron por la Comisión de Doctorado o hace más de 5 años que se aprobaron.

1) Nombre del Curso: ***Tectónica Extensional Continental***
2) Características del curso (Extensión, Posgrado, Doctorado): **Postgrado**

3) Modalidad del dictado del curso (marcar con una X todas las que correspondan y horas /semana)

a) Teórico _____20_____Hs. Semana
b) Practico (Lab.)_____20_____ Hs. Semana
c) Teórico – Práctico_____ Hs. Semana
d) Problemas_____ Hs. Semana
e) Seminarios_____5_____ Hs. Semana
f) Salidas a campo_____ DIAS

4) Modalidad de Evaluación (indicando cantidad de parciales, trabajo final, orales, escritos etc.). **El curso puede realizarse bajo dos modalidades:**

- ✓ **Aprobación de 1 (un) examen final. Esta modalidad tendrá puntaje para doctorados.**
- ✓ **Asistencia sin evaluación y presentación de casos en forma oral.**

5) Docentes: **Cuatro docentes (4).**

5a) A cargo: (Nombre, Apellido y Cargo con el que revista en la FCEN o aclaración que no pertenece a FCEN. Silvia Barredo **(UBA), Laura Giambiagi, CRICyT – IANIGLIA, CONICET; Amancay Martínez, MAPas; Maísa Tunik, Comahue – CONICET.**

5b) Auxiliar: (Nombre, Apellido y Cargo con el que revista en la FCEN o aclaración que no pertenece a FCEN. ----------

5c) Invitado: (Nombre, Apellido y Cargo con el que revista en la FCEN o aclaración que no pertenece a FCEN (adjuntar CV). ----------

6) Cantidad de horas totales de duración del curso: **45 horas totales distribuidas en una semana. Se dictará con un mínimo de 5 alumnos y un máximo de 30.**

7) Período de dictado: SEGUNDO **cuatrimestre de 2008**
Fecha inicio: AGOSTO **de 2008**
Fecha de finalización: AGOSTO **de 2008**

8) Horario tentativo: **9 a 19 hs horas con intervalo para almuerzo, días a determinar.**

9) **VER ANEXO**

11) Puntaje solicitado para las Carreras de Doctorado de esta Facultad: **1 puntos**

12) Arancel propuesto.

$ 200 invitados de otras universidades y grupos de investigación y $ 500 para a interesados enviados por empresas.

PROGRAMA

Curso Tectónica Extensional Continental

Dictado por

Dra. Silvia Barredo (UBA)

Dra. Laura Giambiagi (IANIGLA-CONICET)

Dra. Amancay Martinez (MAPas)

Dra. Maísa Tunik (COMAHUE-CONICET)

MÓDULO I

1. Introducción por Silvia Barredo

1.1 Revisión de conceptos tectónicos

- Litósfera – astenósfera
- Flujo térmico
  - Origen del calor terrestre
  - Mecanismos de transmisión del calor
- Movimiento de placas
- Fuerzas tectónicas

1.2 Definición de un rift

1.3 Características de un rift actual

1.4 Tipos de rift

- Clasificaciones
  - Propuesta de Keary y Vine (1996)
  - Propuesta de Sengör (1995)
  - Propuesta de Ziegler y Cloething (2003)
- Angostos o amplios
- Simétricos o asimétricos

1.5 Ejemplos mundiales de rift actuales

- Sistema de rift Golfo de Suez-Mar Rojo-Golfo de Aden
- Sistema de rift del Africa Oriental
- Graben del Rhine
- Rift de Baikal
- Basin and Range

2. Geodinámica de un rift por Laura Giambiagi

2.1 Reología de la litósfera continental

- Modelo de reología de la litósfera continental
- Transición frágil-dúctil
- Perfiles de resistencia

2.2 Modelos de mecanismos de generación de un rift y origen de tensión litosférica

- Rift pasivo
- Rift activo
- Puntos calientes

2.3 Modelos de extensión litosférica

- Modelos de cizalla pura
  - Modelo de atenuación litosférica uniforme
  - Modelo de atenuación litosférica no uniforme
- Modelos de cizalla simple
  - Modelo de Wernicke
  - Modelo de estrechamiento litosférico
  - Modelo de desacople corteza superior – corteza inferior
- Modelos de cizalla pura / cizalla simple

2.4 Parámetros que controlan la deformación litosférica

- Velocidad de deformación
- Condiciones iniciales
- Propiedades reológicas de la litósfera

2.5 Evolución dinámica de un rift

Duración de un rift
Razones por las cuales un rift se aborta
Migración del foco de extensión
Parámetros físicos que controlan la evolución dinámica de un rift

3. Rasgos estructurales en cuencas de rift por **Laura Giambiagi**

3.1 Revisión de conceptos estructurales

Esfuerzo y deformación: esfuerzo, estado de esfuerzos, tipos de esfuerzos, deformación, relación entre esfuerzo y deformación
Fracturas
Clasificación de fallas

3.2 Fallas normales y estructuras asociadas

Descripción de fallas normales
* Geometría y ubicación en el espacio
* Dimensiones
* Movimiento

Estructuras sin-depositacionales
Estructuras asociadas a fallas normales
* Graben, horst y hemi-graben
* Anticlinal de roll-over
* Estructuras de colapso de pared colgante
* Fallas sintéticas de pared basal
* Sinclinal y anticlinal de pared colgante
* Pliegues forzados extensionales
* Fallas de liberación

3.3 Arquitectura del rift

Características de un hemigraben
Características de un graben
Tipo de fallamiento en la corteza superior
* Familias y sistemas de fallas
* Patrones de fallas
* Superposición de fallas
* Nivel de despegue

Zonas de transferencia y de acomodación
* Fallas de transferencia
* Rampas de transferencia

Extensión y diapirismo
Evolución temporal y espacial del sistema de fallas
* *Ejemplo*: El depocentro Atuel de la Cuenca Neuquina

Jerarquías de fallas
* Fallas mayores
* Fallas medianas
* Fallas menores

MODULO II

3. Rasgos estructurales en cuencas de rift por **Laura Giambiagi** **(Continuación)**

3.4 Influencia de la fábrica del basamento

Reactivación vs. retrabajo
Fallas normales oblicuas

Tendencia al deslizamiento de una falla preexistente
Fábrica del basamento
* Rift con influencia de fábrica regional
* Rift con influencia de fábrica discreta
    * *Ejemplo*: Reactivación de zonas de cizalla en el rift del Africa Oriental
    * *Ejemplo*: Retrabajo litosférico durante la extensión permo-triásica en el sudoeste de Sudamérica

3.5 Rift oblicuo y rift ortogonal con influencia de fábrica de basamento

Modelos análogos de rift oblicuo
Características de un rift oblicuo
Rift ortogonal vs. rift oblicuo
Rift con múltiples sets de fallas
* Discusión de posibles causas:
    - Rift polifásico
    - Rift con reactivación de fábrica de basamento
    - Rift con retrabajo litosférico
    - Desarrollo simultáneo de fallas bajo deformación 3D
    - Perturbación de esfuerzos cerca de fallas principales
    - Permutación de esfuerzos

3.6. Inversión tectónica

Inversión tectónica una falla normal
* Reactivación de fallas pre-existentes vs. generación de fallas nuevas

Estructuras asociadas a inversión
Inversión tectónica de un rift
Tipos de interacción entre estructuras compresivas y fallas extensionales pre-existentes
Inversión de un rift oblicuo
Evidencias de inversión
* *Ejemplo*: inversión en la faja plegada y corrida Malargüe
* *Ejemplo*: inversión en la faja plegada y corrida Aconcagua

Inversión durante la extensión

Exposiciones de casos de estudio de los participantes y discusión

4. Sedimentación en ambientes de rift por **Maisa Tunik**

4.1 Cuencas sedimentarias – introducción

Análisis multidiciplinario de una cuenca sedimentaria
Generación de cuencas sedimentarias
Clasificación de cuencas sedimentarias
Mecanismos de subsidencia

4.2 Cuencas de Rift

Generalidades
Importancia de las cuencas de rift

4.3 relleno sedimentario de las cuencas de rift

Sedimentos de prerift, sinrift y postrift

Factores que influyen en el relleno de las cuencas de rift
Estadio de iniciación del rift vs. Estadio de clímax del rift
Sistemas de drenaje
Abanicos aluviales
Hemigrábenes
Subcuencas abiertas vs. Cerradas
Flujos transversales y axiales

4.4 modelos de distribucion y evolución de facies en las cuencas de rift

Iniciación del rift vs. Estadio de clímax del rift

Evolución tectono-sedimentaria de las cuencas extensionales activas

* Estadío de inicio en un rift en ambiente continental
* Estadío de inicio en un rift en ambiente marino costanero
* Estadío de interacción y unión de un rift en ambiente continental
* Estadío de interacción y unión durante un período de nivel de mar alto en un rift en ambiente marino costanero
* Estadío generación de rechazo en las fallas en un rift en ambiente continental
* Estadío de generación de rechazo de las fallas de un rift en ambiente marino costanero
* Estadio de desactivación de fallas en un rift en ambiente continental

Modelos de distribución de facies

* Facies en rift continentales
  - Cuencas de rift continentales con drenaje interior o lagos
  - Cuencas de rift continentales con sistemas axiales de drenaje
* Facies en rift marinos
  - Cuencas marinas silicoclásticas

Cuencas marinas carbonáticas

5.5 cuencas de rift particulares

Sinclinales en horst

Tipos de sinclinales en horst

4.6 Relleno postrift

4.7 Petrografia y procedencia en ambientes de rift

MODULO III

5. Tectónica extensional y sedimentación por **Silvia Barredo**

5.1 Levantamiento y subsidencia

5.2 Factores que controlan la sedimentación en un rift

* Climáticos
* Tectónicos
* Geográficos

5.3 Estratigrafía secuencial

Cambios del nivel del mar: eustáticos y relativos

Espacio de acomodación: nivel de base geomórfico

Los cambios del nivel del mar y el desarrollo de las secuencias

Geometría y apilamiento de de las secuencias

5.4. Estratigrafía secuencial en ambientes continentales

Ambientes continentales

Espacio de acomodación y aporte de sedimentos

Nivel de base estratigráfico

Patrones de apilamiento vs. acomodación

Secuencias tripartitas

Arquitectura de las cuencas

* Influencia de las variables, tectónica (alzamiento/subsidencia), clima y tasa de sedimentación

5.6 Efecto de las fallas sindepositacionales y el plegamiento en el relleno de un rift

Estructuras asociadas a fallas y pliegues.

Modelo de evolución de fallas extensivas:

* falla única
* sistemas de fallas de igual polaridad
* fallas conjugadas.

Modelos numéricos de interacción de los segmentos de falla.

Evolución de los depocentros asociados.

Control por fábrica previa.

Diacronismo en el pasaje de rift a post -rift.

Control en la evolución de los ambientes y en la geometría de los cuerpos depositacionales por subsidencia diferencial a lo largo de las estructuras extensivas del rift.

Estratos de crecimiento: integración de la estructura con la sedimentación y los cambios de nivel de base: el caso del *tri-shear*.

5.5 Control tectónico en secuencias aluviales

Influencia de la tectónica y el clima

Evolución tectosedimentaria de las zonas de transferencia

*

5.6 Control tectónico en el registro estratigráfico de secuencias fluviales

Incisión fluvial
Avulsión: influencia de la fábrica estructural
Perfil de equilibrio
Influencia de las estructuras en la arquitectura fluvial
Paleosuelos como indicadores de espacio de acomodación

5.7 Control tectónico en el registro estratigráfico de secuencias lacustres

Clasificación de lagos
Control climático
Control tectónico
Control en la producción de materia orgánica

5.8 Control tectónico en el registro estratigráfico de secuencias deltaicas

Influencia del nivel de base geomórfico
Influencia de las estructuras extensivas
Influencia de la morfología de las cuencas
Influencia de la subsidencia diferencial y los cambios de nivel de base (geomórfico o estratigráfico)

5.9. Los hidrocarburos en cuencas de rift

* Estadío de rift: margen activo, margen flexural zonas de transferencia
* Estadío de post-rift o *sag*
* Discusión y estudio de casos

Práctico de tectónica y sedimentación

MODULO IV

6. Extensión y magmatismo por **Amancay Martinez**

6.1 Descripción del magmatismo en los diferentes estadios de un rift
Rift volcánico y no volcánico
Subplacado basático
* Ejemplos

6.2 Influencia de la actividad volcánica en el desarrollo de un depocentro
Distribución del magmatismo en una cuenca de rift

6.3 Colapso extensional y magmatismo asociado
* Ejemplos

6.4 Caracterización geoquímica del magmatismo en rift antiguos. Reconstrucción del mismo según su química.

* *Ejemplo*: volcanismo en las cuencas de rift triásicas argentinas.

MODULO V

7. Conclusiones: estudio multidisciplinario de un rift

Metodología para el estudio de un depocentro

* Análisis geométrico de un depocentro
* Análisis cinemática de un depocentro
* Análisis dinámico de un depocentro

Metodología para el estudio de un rift

* Integración de análisis geométricos de los distintos depocentros
* Integración de análisis cinemáticos de los distintos depocentros
* Integración de análisis dinámicos de los distintos depocentros

* **Casos de estudio y discusión**

"Apertura, evolución e inversión tectónica del depocentro Atuel de la Cuenca Neuquina" por Laura Giambiagi

"Evolución tectosedimentaria del depocentro Rincón Blanco y su vinculación con la Cuenca Cuyana" por Silvia Barredo

OBJETIVO: El objetivo del curso consiste en brindar un enfoque multidisciplinario en el estudio de cuencas extensivas. En principio porque cualquier cuenca requiere de múltiples herramientas para su modelado teórico pero en particular en el caso de las cuencas de rift, no se puede sino a través de la convergencia de datos y del cruzado de información arribar a modelos coherentes con las observaciones de campo.

También es importante destacar que este tipo de cuencas en nuestro país reúne aquellas productivas de hidrocarburos, de manera tal que los modelos presentados en el curso aportarán a la exploración geológica de este recurso energético, ya que brindarán nuevos enfoques en la interpretación de la evolución cinemática y sinsedimentaria de las mismas, pero en un contexto geotectónico.

Se ahondará en las características estructurales de las cuencas extensivas, en el tipo de litósfera involucrada y su magmatismo, en los ambientes sedimentarios que pueden desarrollarse en dichas cubetas y, finalmente en la tectosedimentación, es decir en la integración global de todos estos parámetros con énfasis en los controles tecto-climáticos que condicionan la sedimentación.

La interacción con potenciales profesionales y alumnos de doctorados a través de discusiones de casos permitirá la crítica de modelos locales e

internacionales. Las docentes también expondrán los resultados de sus estudios en las Cuencas Cuyana y Neuquina para el período comprendido entre el Permo-Triásico al Jurásico.

Carga horaria: Total cuarenta y cinco (45) horas, veinte (20) de teóricas, veinte de prácticas y 5 de exposición de trabajos, distribuidos en la semana.

Alumnos: Mínimo (5) Máximo (30).

Material de trabajo: se entregará una guía con la síntesis de los conceptos trabajados en clase para que los alumnos utilicen durante el dictado del curso. Se estima cubrir el costo de las mismas con la inscripción de alumnos ajenos a la UBA.

Evaluación: El curso se aprobara a través de un examen final que podrá otorgar puntaje para el doctorado o a través de asistencia sin evaluación y, en ambos casos con la exposición de un estudio de caso.

Destinado a: Graduados en Geología, Geofísica, Ingeniería y carreras afines. Solo en modalidad asistencia estudiantes avanzados (ultimo año) de carreras afines.

Docentes: Dras. Barredo Silvia; Giambiagi, Laura; Martínez, Amancay y Tunik, Maísa.

CURSO TECTÓNICA EXTENSIONAL CONTINENTAL
BIBLIOGRAFÍA

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