2016 Meeting Report Form

Project Number and Title: IGCP Project 641
M3EF3: Mechanisms, Monitoring and Modelling Earth Fissure generation and Fault activation due to Fluid exploitation

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MEETING: Second Workshop M3EF3

Date: November 2-6, 2016
Place: Puerto Vallarta and Guadalajara, Mexico
Itinerary: November 2nd, Puerto Vallarta: a course to MSc and PhD students participating at Reunion Anual de la Union Geofisica Mexicana (RAUGM) 2016 (from 8:30 to 19:30);
November 4th, Puerto Vallarta: a RAUGM-2016 technical session on Land Subsidence (from 8:30 to 13:30);
November 5th-6th, Guadalajara: a field trip to geological structures and earth fissures in Jalisco.

SCOPE AND RESULTS OF MEETING:

Scope of Meeting (program or outline of geological study)

The aim of the meeting, which was held in conjunction with the 2016 Annual Meeting of the Mexican Geophysical Union (RAUGM), was to enhance the awareness of the geological and geophysical scientific community in Mexico regarding the consequences of groundwater exploitation in term of ground rupture. Three events were organized:

- a workshop (CU03 M3EF3): "*Mecanismos, Monitoreo y Modelado de la generación de Fracturamiento del terreno y activación de Fallas debido a la extracción de Fluidos del subsuelo"* about mechanisms, monitoring and modeling ground rupture for MSc and PhD students;
- a technical session (SE07 *Evaluación de procesos de subsidencia del terreno en el mundo. Grupo de trabajo de Subsidencia del Terreno de la UNE*SCO) and a round table in cooperation with the UNESCO Working Group on Land Subsidence;
- a field trip to sites in the Jalisco State strongly affected by earth fissuring.

Achievements of Meeting

The course (CU03 M3EF3) programme:
8:30-10:30: **General Concepts: Introduction, Hydrogeological implications, Geomechanics, Characterization**, by Devin Galloway (USGS) and Dora Carreón (UNAM, Mexico)
10:45-12:45: **Management and Monitoring and of Earth Fissures in Arizona, USA**, by Brian Conway (Arizona Department of Water Resources) and Joseph Cook (Arizona Geological Survey)
15:30-18:30: **Numerical modeling of mechanical features in geological systems**, by Pietro Teatini (University of Padova, Italy) and **Introduction to modeling fractures and faulting and tools**, by Shujun Ye (Nanjing University, China)
18:30-19:30: **Discussion, Questions, Closure**, All professors and attendants

The technical session (SE07):

- *Using Surface Data for Subsurface Characterization*, by Peter Fokker, Thibault Candela
- *Suggestions to Construct a World Map on Land Subsidence*, by Lambert John

- *Análisis Preliminar de las Grietas del Terreno Aparecidas tras la Inundación del 28/09/2012, en Puerto Lumbreras (Murcia, SE España)*, by Joaquin Mulas, Gerardo Herrera, Roberto Tomás, Jose Antonio Fernández-Merodo, Marta Bejar, Luis Jorda Bordehore, Juan Carlos García-López Davalillo, Ramón Aragón Rueda, Rosa María Mateos Ruiz
- *3D Facies-Based Geomechanical Model to Simulate Land Subsidence in the Beijing Plain, China*, by Lin Zhu, Huili Gong, Zhenxue Dai, Rong Wang, Giuseppe Gambolati, Pietro Teatini
- *Evolución Espacio-Temporal de la Deformación Asísmica de la Superficie Terrestre en el Valle de Mexicali, en el Periodo 1993 – 2014, Revelada Usando la Técnica de Interferometría Satelital*, by Olga Sarychikhina, Ewa Glowacka
- *Estudio Sobre Algunos Aspectos Hidromecánicos de la Falla Oriente, Una Estructura Posiblemente Reactivada por el Proceso de Subsidencia en el Valle de Aguascalientes*, by Martin Hernandez, Jesús Pacheco-Martínez, Guillermo E. Campos-Moreno, Pedro de Lira-Gómez, Dora C. Carreón-Freyre, Gil H. Ochoa-González
- *Investigación, Práctica Profesional y Legislación en la Evaluación del Riesgo por Subsidencia en Aguascalientes, México* by Jesús Pacheco-Martinez, Enrique Cabral-Cano, Shimon Wdowinski, Martín Hernández-Marín, José Ángel Ortiz-Lozano, Mario Eduardo Zermeño De León
- *Desarrollo de un Mapa Interactivo de Riesgo for Fallamiento Asociado a Subsidencia del Terreno en la Ciudad de Celaya, México*, by Ana Laura Nila Fonseca, Fabiola González-Domínguez, Adam Alloy, Arisa Ruangsirikulchai, Enrique Cabral-Cano, Suzanne Pierce, John Gentle
  Deformación y Fracturamiento Asociados a la Subsidencia del Terreno en la Delegación Iztapalapa de la Ciudad de México, by Dora Celia Carreón Freyre, Marcos González Hernández, Raúl Gutiérrez Calderón, Mariano Cerca Martínez, Carlos Alcántara Durán, Félix Centeno Salas, Alejandra Jiménez Sánchez
- *The Role of Interdisciplinary Earth Science in the Assessment of Regional Land Subsidence Hazards: Toward Sustainable Resource Management Solutions*, by Devin Galloway
- *Pruebas de Evaluación Cuantitativa de Causas de Subsidencia en el Valle de Mexicali*, Baja California, by Ewa Glowacka, Olga Sarychikhina
- *Cartografía de Movimientos en Masa Asociados a la Subsidencia del Subsuelo en la Colonia el Edén de la Delegación Iztapalapa, Ciudad de México*, by Marcos Hernández González, Dora Carreón Freyre, Raúl Gutiérrez Calderón, Mariano Cerca Martínez
- *Software R, Herramienta para el Desarrollo de Mapa de Riesgo de Subsidencia de la Ciudad de Celaya, México,* by Fabiola Gonzalez Dominguez, Ana Laura Nila Fonseca, Adam Alloy, Arisa Ruangsirikulchai, Enrique Cabral Cano, Suzanne Pierce, John Gentle

Outcome of Meeting

The course was attended by 24 persons, including 15 MSc and PhD students in Geology and Geophysics plus 3 professors. During the final discussion, Mexican students and professors presented their own case studies related to IGCP641 topics, with a fruitful discussion. A number of them expressed the interest to become participants of IGCP641. Approximately 40 scientists participated in the technical session. The session was closed by a round-table discussion focused on the management of land subsidence and related ground ruptures in Mexico. The President of the Mexican Geophysical Union participated actively in the round table.

The field trip took place during the last two days of the IGCP641 meeting. The participants (12 people) visited the village of Jocotepec, near Guadalajara, where impressive fault reactivation due to (illegal) groundwater pumping is ongoing, with significant damages to

roads, private houses and public buildings (e.g., the church of the village). In a post-trip meeting with the director of the Engineering Department of the ITESO University in Guadalajara, it was decided to prepare a technical note and a fact-sheet in Mexico Spanish and in English about the observations and the occurrence in Jocotepec. The note will be distributed through ITESO to the local governmental authorities and the technical consultants managing the resources. The fact-sheets will be distributed to the population to make them aware of the problem and the risks they face.

2nd IGCP M3EF3 Workshop, RAUGM Puerto Vallarta, Jalisco Mexico

Tecnical session (SE07) on Land Subsidence. RAUGM Puerto Vallarta, Jalisco Mexico

Dr. Dora Carreon-Freyre
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December 1, 2016

Signature of Project Leader and Date