

Application Form
2009-10 TWRI Mills Scholarship Program

1. Name of Student and TAMU Student ID Number.

Celso Moller Ferreira

2. Contact Information:

3. Name and Contact Information (Address, E-mail and Phone number) for Faculty Advisor or Committee Chair.

Dr. Francisco Olivera. Texas A&M University, Department of Civil Engineering, 3136 TAMU, College Station, Texas 77843-3136. Tel.: 979-845-1404. e-mail: folivera@civil.tamu.edu

4. Description of the student's proposed research, emphasizing how it will address a water resources-related concern (particularly how, if possible, it will benefit Texas).

Damage estimation of hurricane flooding in Corpus Christi, Texas, under global warming scenarios

The State of Texas has historically faced several hurricane related damages episodes, with Ike being the most recent example. Under global warming scenarios, water related hazards tend to increase considerably and flooding and storm surge become a major issue for coastal cities throughout the state. Researchers of the Department of Civil Engineering at Texas A & M University are currently working on evaluating the impacts of global warming on hurricane-related flooding in Corpus Christi, Texas. Preliminary results found that sea level is projected to rise 2.6 feet for a high-trapping gas emission scenario. Hurricanes are projected to become more intense as ocean water continues to warm, by 2030 hurricane flood levels could increase by 3 to 27 percent and damages are projected to arise from 60 to 100 percent ¹. A limitation of the first analyses was the lack of data to explore in more detail the damages caused by storm surge, sea-level rise and riverine flooding. In order to overcome these limitations, this project will consist of applying a GIS based approach to evaluate damage from global warming scenarios of hurricane related storm surge and riverine flooding over the Corpus Christy area. The FEMA GIS based application, HAZUS, is being used to perform these analyses. This application was design to support damage evaluation from natural disasters running under a GIS platform (ArcGIS). To support the damage assessment, a flood modeling approach will be developed considering the global warming scenarios as input in addition to the already developed storm surge data, which will then be coupled together to forecast water levels in the study area. Water levels from flooding due to riverine are being inferred using HEC-HMS and HEC-RAS models considering the same global warming conditions of the scenarios that the surge data was developed. A set of water levels for the entire study area resulting from each global warming scenario and projected wind speed data will then be used as inputs to HAZUS, to perform spatial evaluation of damage, considering direct and indirect losses from buildings (residential, commercial, industrial) as well as damages to utilities (water, gas, refineries, etc), transportation systems, agricultural areas and demographic losses. The HAZUS parcel geodatabase is going to be updated with a more detailed parcel database provided by the municipality. GIS applications are used to calculate financial losses according to each global warming scenario and provide specific results to each location, facilities or land use categories. This data is useful to support agricultural, urban and industrial planning under global warming scenarios. Results will then be presented spatially distributed representing areas of higher hazard (flood and storm surge) risk, financial losses and estimated damages percentage. This data can be used to support planning and decision making, by publishing maps in the internet from a Texas A&M web server. Once this methodology is validated, this

¹ Irish, J., A. Frey (*), M. Mousavi, F. Olivera, B. Edge, J. Kaihatu, Y. Song, L. McNeill and S. Finn, Predicting the Influence of Climate Change on Hurricane Flooding, submitted to the National Commission on Energy Policy, Texas A&M University, 2008.

GIS process can be easily extended to evaluate hurricane flooding damage from global warming scenarios in additional Texas coastal areas.

5. Academic Qualifications of the Student

I am a graduate student in the first year of the PhD Program in Water Resources Engineering at TAMU and I am working as a Teaching Assistant for the course CVEN 339 - Water Resources Engineering in the Department of Civil Engineering. My research interest is in GIS applied to water resources engineering under the advising of Dr. Olivera. I am the recipient of the FLOWREP (Future Leaders of Water Resources Professorate) fellowship, from the Zachry Department of Civil Engineering with strong focus on research, teaching and professional development. This first year of Teaching Assisting I have been awarded the Outstanding Graduate Teaching Assistant Award 2009 from the Department of Civil Engineering. Also related to teaching activities, I have concluded the Graduate Teaching Academy – GTA program of Texas A & M University becoming a GTA fellow. At the 2009 Texas A & M Student Research week, I won the 1st Price Taxonomy Winner (GIS) and the Environmental Health and Safety Department Safety Recognition with the research entitled Geo Hydrologic Information System for the State of Santa Catarina in Brazil. I am currently the President (Chief Student Leader) of the American Water Resources Association – AWRA Texas A & M University Student Chapter for 2009-2010. During my first year in the program, I have taken 20 credit hours courses including:

During my first semester, I have worked to set up a proposal for a cooperation agreement between TAMU and the State of Santa Catarina, Brazil, which is still under negotiation and aims to develop a Hydrological Information System based on the Arc Hydro data model and NHDPlus concepts using local data. During my second semester, I have been developing preliminary research using the HAZUS GIS model to support ongoing climate change departmental research. I have approximately five years of experience working with water resources engineering and GIS. Additionally, to increase my understanding of the world and the people that we are trying to model, I have traveled, studied or worked in more than 20 countries. From my international education experience I should mention my Master of Engineering in Applied Hydrology from CEDEX (Madrid, Spain); an international graduate study abroad program at the Department of Hydrology and Water Resources of the University of Arizona for one semester and a course in Applied Groundwater Modeling at UNESCO – IHE Institute for Water Education (Delft, Netherlands). I have graduated in Civil Engineering with a major in Environmental and Sanitary Engineering and I have a M.Sc. in Environmental Engineering, both from Federal University of Santa Catarina, Brazil. Currently, I am working on a summer internship at the ESRI headquarters, where I have been selected to join the 2009 ESRI Summer Internship Program. I am working in the development and applications of the ArcHydro data model and tools, GIS applications to support hydrology and hydraulic models and hydrological surface and terrain analyses.

6. Proposed use of funds resulting from this Scholarship

The funds are to be used to support conference attendance, purchase of computer hardware and to support ongoing research activities.

7. Intended career path the student anticipates pursuing.

I am pursuing an academic and research career. I want to dedicate the next 3 years of my PhD to develop qualified research related to Texas water resources and apply the knowledge acquired through my education in these activities. During this period, I want to also increase my teaching experience, practicing within our institution. Once I conclude my PhD, I am willing to pursue an Academic position in a prestigious US university that allows me to teach and research GIS applied to water resources.