

SIP# 286 Round 2

Title: Palaeotsunami/Large Waves: Frequency, magnitude and potential impact on communities and installations along the southern African coast

Acronym: REPSAR

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: Motivation The Indian Ocean tsunami of 26th December 2004 caused widespread devastation and loss of life and livelihood. Tide gauges showed wave heights of up to 2.9 m above normal levels along the South African coastline and several other historical tsunami have been reported, dating back to 1809. Although southern Africa is far removed from major seismic sources, other mechanisms of tsunamigenesis such as volcanic activity, bolide impact, submarine slumps and terrestrial landslides/rockfalls pose a significant, unquantified risk. For instance, in 1955 a massive rock slab collapsed into Lutuya Bay, Alaska, causing a wave over 500 m high, the largest on record. No systematic attempt has yet been made to study evidence for palaeotsunami in the southern African stratigraphic record. Objectives The primary thrust is to extend the record of tsunami/large waves into the Holocene and even Late Pleistocene to acquire deeper insights into their frequency, magnitude and impact. This would result in a refined assessment of the vulnerability, hazards and risks presented to coastal communities and installations, facilitating prediction, mitigation and adaptation strategies. The study would have relevance to Europe, since large tsunami are global events. Additionally, numerical modeling and empirical observations of the effects of waves generated by non-seismic sources, particularly terrestrial landslides/rockfalls in the southern African context would be applicable to Europe. Methodology • identify coastal segments with a high vulnerability to tsunami • identify coastal Cenozoic deposits with a high probability of preserving tsunamiites • identify ancient large landslides/rockfalls into coastal embayments and estuaries and map future vulnerable areas • apply appropriate techniques to identify and date palaeotsunamiites • interpret and model the magnitude, frequency, source and impact of positively identified palaeotsunami Technologies Technologies relating to sedimentology, geomorphology, geophysics, seismology, remote sensing, GIS and geochronology would be employed.

Expertise offered: The current research group has wide experience and expertise in the fields of coastal Cenozoic geology/geomorphology, structural geology, GIS, marine geoscience, seismology and radiocarbon dating. The Cenozoic geologist is qualified to Ph.D. level (sedimentology) and also has a BSc (Hons.) in Palaeontology with extensive previous experience (14 years) in coastal Cenozoic palaeo-sea level research (dating and correlation of raised marine terraces), palaeontology, sedimentology and stratigraphy. He has also attended and presented papers at field symposia and conferences on palaeotsunami. Expertise in structural geology with emphasis on the seismogenic potential of geological faults and associated seismic risk is available. A fully equipped marine geoscience unit comprising 4 scientists is able to conduct a variety of offshore geophysical surveys, including single and multibeam echo-sounding and shallow seismics. A radiocarbon geochronologist with 10 years experience, including the dating of shallow marine sediments forms part of the team, as do two highly qualified GIS experts

Previous FP involvement: None

Consortium status: The research group currently comprises: personnel from the Council for Geoscience. A radiocarbon geochronologist from CSIR and four European research groups have expressed willingness to join the consortium:

Expertise sought: The partner(s) would need the capacity to play a major role in the conceptualization, motivation for funding and conduct of the project. Expertise in one or more of the following areas is required: palaeotsunami research; numerical modeling; geochronology; GIS; and remote sensing.

Related projects: International bilateral cooperation

SIP# 301 Round 2

Title: Biomarkers of pollution in freshwater fish

Acronym: BPF

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project (small scale)

Summary: The aims of this project are to develop techniques for the assessment of biomarkers of pollution in freshwater fish. The biomarkers are histopathological and cytological changes in the gonads and liver, Heat Shock Proteins (HSPs) in the liver, gonads and gills, and the effects of endocrine disruption in the gonads. The specific aims are: 1) The implementation of histopathological changes in the testis and liver as a technique to quantify metal pollution. 2) To establish whether Heat Shock Proteins (HSPs) are specific biomarkers for metal pollution in the gonads and to link it with histopathological changes in quantifying metal pollution. 3) To investigate the employment of existing techniques for the occurrence of endocrine disruption. These techniques are being developed at the University of Stellenbosch. 4) The applicability of cytological information from the gonads in the assessment of metal toxicity.

Expertise offered: Sampling equipment for fish. Aquarium facilities for exposure experiments and maintenance of experimental fish Well equipped laboratory for biomarker analysis, ICP MS, electrophoresis, spectrophotometric procedures, Histology of affected organisms

Previous FP involvement: None

Consortium status: Experts in the field of biomarker analysis, specifically Hsps and enzymes. Biomarker to determine the effect of EDCs

Expertise sought: Molecular techniques for biomarker analysis, verification

Related projects: None

SIP# 303 Round 2

Title: The evolution of seawater circulation patterns in the southwestern Indian Ocean from Nd and Pb isotopic records in manganese deposits

Acronym: Marine Manganese

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project (small scale)

Summary: Natural radiogenic isotope tracers in seawater, such as Nd and Pb, are of particular value in the study of ocean circulation and mixing. The Nd and Pb isotopic compositions of seawater at a particular site in the oceans is determined by the composition of the input material, the dispersal of this signature through ocean circulation and the residence time of the isotopes in seawater. As a result, different water masses have identifiably different isotopic signatures. Marine manganese deposits incorporate elements from ambient seawater during their growth and have been shown to preserve records of seawater Nd and Pb which are recoverable on the million year time scale up to and beyond 20Ma. These records of secular changes in the seawater isotope tracers Nd and Pb play a key part in reconstructing the patterns of ocean circulation. With sufficient control on the chronology of these changes, their relationship to changes in climate and palaeogeography may be assessed. This project aims to analyse marine manganese deposits from the Mozambique Ridge and Mozambique Basin off the east coast of southern Africa. These deposits occur over a large depth range and the possibility exists of reconstructing the tracer history of different parts of the thermohaline circulation around southern Africa and Madagascar, including Antarctic Bottom Water (AABW), North Atlantic Deep Water (NADW) and the Agulhas Current. This project will lead to an improved understanding of the evolution of ocean circulation patterns around southern Africa and their response to climate change and variations in palaeogeography. The South African researchers will gain valuable experience in analytical techniques not available in South Africa, and the results of the project will support other marine geology research initiatives currently ongoing around the margins of southern Africa.

Expertise offered: University of Kwazulu Natal, Department of Geology: Prof M. K. Watkeys is a highly experienced researcher involved in investigations into the geological evolution of the seafloor off the east coast of southern Africa, including the Mozambique Ridge and Mozambique Basin. CSIR, Applied Geoscience Research Group: Dr S Perritt has experience in marine geology and geochemistry and has previously been involved in projects examining the major and trace element characteristics of the manganese deposits of the Mozambique Ridge and Mozambique Basin and their relationship to environmental conditions in the southwestern Indian Ocean.

Previous FP involvement: None

Consortium status: The project has the backing of two South African consortium members to date: the CSIR and the University of Kwazulu Natal.

Expertise sought: The project requires an EU consortium partner who has the necessary experience and laboratory facilities to undertake Nd, Pb and Be isotopic analysis of marine manganese deposits. There are currently no such facilities/expertise available in South Africa. The Isotope Geology Research Institute at Bern University, Switzerland, has been approached in this regard and we are waiting for their response.

Related projects: International bilateral cooperation

SIP# 305 Round 2

Title: Resource conservation through sustainable land use systems in the Limpopo River Basin

Acronym: RECCLU

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: The proposed project's goal is to improve the quality of life of people through land use practices which foster sustainable management of resources. Interactions between humans and ecosystems through land use are some of the most important factors influencing the integrity of the global environment. Land use is an expression of both the opportunities and constraints presented by the interactions among biophysical, economic, social and technological components operating in a particular environment at a particular time with a particular history. Historically, land use systems have been managed within the context of individual economic sectors, each of which produces a single service, and often maximising certain services e.g. biomass production at the expense of others e.g. biodiversity conservation. This approach has largely degraded the resource base. Future environmental security depends on how effectively all the elements (ecological, social, economic) of land use are understood and managed. This project will, through interdisciplinary case studies of selected land use systems in the Limpopo Basin in Mozambique, South Africa and Zimbabwe develop, adapt and test integrative scientific techniques for use in land use planning and management. The project is expected to improve both science-based and land users forecasting capabilities and enhance decision-making, monitoring and assessment through the following outputs at different scales: • Conceptual models of systems • Indicators of performance and sustainability • Tools for performance and sustainability assessment • Integrated assessment models The project has a capacity building component as it will involve all stakeholders in learning and experimentation cycles. This project has common elements with European studies such as the Sava River Basin Project (www.sarib.net), the Danube Regional Project (www.undp.drp.org) and the SEAMLESS Project (www.seamless-ip.org). Collaboration between the Limpopo and European studies would allow joint work on integrative and modelling techniques and comparisons of human-environment interactions under different socio-economic settings.

Expertise offered: Interdisciplinary teams of scientists will work on the ecological, social and economic aspects of land use in each of the three countries. The South African component of the study will be conducted by a team from the Council for Scientific and Industrial Research and the University of Venda. The Zimbabwe component of the study will be led by a team from the University of Zimbabwe, while a team from Eduardo Mondlane University will lead the study in Mozambique. The three country teams will work together as a Basin Team, addressing issues such as research tools and methodologies, integration and synthesis jointly. The Limpopo Basin team has expertise in environmental science, soil science, hydrology, ecology (plant, animal, human and agricultural), social science, GIS, infrastructure planning and analysis and resource economics. The team has accumulated research experience in the Southern African environment and can share this with European partners.

Previous FP involvement: None

Consortium status: Researchers at the CSIR, University of Venda and University of Zimbabwe have already indicated their willingness to join the consortium. Discussions with researchers in Mozambique are in progress.

Expertise sought: Partners with expertise and experience in integrative research and modelling, indicator development

Related projects: FP6

SIP# 308 Round 2

Title: Estrogenic and androgenic activity in chemicals and environmental samples for reproductive toxicology tests

Acronym: EDC, tox, assays

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Environmental Technologies

Type of project: R&D project (small scale)

Summary: There is concern that both humans and wildlife are exposed to environmental chemicals that interfere with the normal endocrine function. These chemicals can elicit adverse effects on reproductive health contributing to the increasing rates of certain types of reproductive disorders. In the environment, endocrine disrupting chemicals (EDCs) occur as complex mixtures with potencies ranging over several orders of magnitude. Screening bioassays that determine estrogenic and androgenic activity are useful techniques for the determination of receptor-mediated activities in environmental samples. These assays can be used for screening, biomonitoring and reproductive toxicology purposes. International concern has led a number of countries to develop in vitro screening programmes for EDCs. The Global Water Research Coalition (GWRC) EDC toolbox project identified five in vitro bioassays namely, the recombinant yeast estrogen screen, MELN reporter gene assay, Kbluc reporter gene assay, ER-CALUX reporter gene assay and the E-screen cell proliferation assay to be investigated. This initiative addresses the need for multiple bioassays to evaluate the different modes of action. In the face of growing public and policy concerns due to the changing environments effects on human health there is a need to develop a battery of screening tests that can be used to detect estrogenic and androgenic activity in environmental matrices and the possible effects of EDCs. As many EDCs have been implicated in reproductive disorders it is useful to include reproductive toxicology animals studies (OECD guidelines) once identified target chemicals have been assessed using the screening assays. In South Africa there is increasing evidence that our aquatic systems are being polluted with EDCs. These systems need to be assessed and monitored for EDC contamination. The specific or combination of EDCs needs to be identified and studied further using OECD toxicology protocols in order to determine the possible reproductive effects of such mixtures.

Expertise offered: The laboratory has the following established: Animal toxicology (OECD protocols) methodology includes Hamilton Thorne CASA system for sperm motility assessment. Reactive oxygen specie (ROS) determination. The recombinant yeast screen bioassay for estrogenic activity. Under development the reporter-gene cell lines; KBluc (estrogenic) and MDA-Kb-2 (androgenic) screening bioassays for EDC activity

Previous FP involvement: None

Consortium status: University of Johannesburg, CSIR, North West University

Expertise sought: Looking for European institutions involved in screening bioassays for endocrine disrupting chemicals and reproductive toxicology studies involving EDCs

Related projects: South African national R&D programmes

SIP# 320 Round 2

Title: Water as a conduit to resilience and co-operation

Acronym: WCRC

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project (small scale)

Summary: With the impact of climate change on the water cycle and resources vulnerable communities become even more vulnerable to hazards. This project aims to build resilience through capacity building and organisational strengthening, understanding and self monitoring through increased efficiency and involvement of civil society in the research processes. The strength of the project is that it works at the grassroots level within district municipalities creating a model of excellence in terms of resilience that can be replicated within other developing country contexts. The focus of the project is on awareness around mechanisms of decision making, self assessment, collection, management and monitoring of indicators and assessment tools so as to maximise policy or/and to influence policy

Expertise offered: Stakeholder participation and capacity building expertise at the grass roots level. Survey expertise and monitoring and evaluation expertise - creation of indicators and training of how to select, apply, manage and monitor indicators as well as an expertise in building resilience and co-operation of organs of civil society using innovative techniques - including street theatre and drama. Also offer expertise at the local level in rain forecast as it affects small scale farmers

Previous FP involvement: None

Details of previous FP involvement: TWIN BAIN project in 6th Framework

Consortium status: Working relationship within Water Institute at the University of Pretoria and with Bolivian Researchers as well as France Eau

Expertise sought: Climate change and the impact of climate change on the water cycle - technical advice required. Creation of impact indicators that can be adjusted from developed to developing country contexts

Related projects: South African national R&D programmes

SIP# 330 Round 2

Title: Early detection of land degradation in arid areas, by the holistic assessment of geomorphological indicators with Remote Sensing techniques

Acronym: Geomorph-Degrad

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: R&D project (small scale)

Summary: The project aims to investigate the nature and magnitude of geomorphic surface changes indicative of early land degradation stages in arid and semi-arid areas, by means of analysing high-resolution remote sensing data (ETM+, SPOT 5 and higher, as well as active sensors). Existing algorithms will be evaluated and new processing techniques developed and tested to assess their suitability to detect these early-stage geomorphic changes from space. Land degradation and desertification are becoming increasingly burning issues in the light of regional and national planning and international policy-making towards a sustainable future. However, most desertification/ land degradation assessment methods and programmes focus primarily on vegetation changes, sometimes with the inclusion of pedological, seldom hydrological parameters. Ground evidence and long-term observations, however, show that in many degradation cases, micro- and meso-scale geomorphological changes precede, or at least, coincide with, the degradation of plant cover and topsoil. Still, due to their much more difficult assessment, geomorphic indicators and surface changes largely go unnoticed. Although these geomorphic changes are triggered and (initially) operating at small scales, they affect and eventually threaten huge areas. Experience from dryland geomorphic history and geomorphological process assessment shows that these changes can be detected even at an early stage by Remote Sensing techniques, provided their role in the geo-ecological system is properly understood. Geomorphic changes immediately influence any spectral signal by modifying the value of mixed pixels, mostly in the Near-Infrared, but also in other wavelengths, even thermal IR. For detection by active sensors, geomorphic surface changes will be noticeable in overall changing degrees of surface roughness/smoothness, microwave penetration depth, and their respective spatial arrangement. The field results from ground checks in pre-identified vulnerable areas (various degrees of aridity, various degrees and spatial patterns of human interference) will be linked to methods of holistic Remote Sensing data analysis and advanced processing techniques including e.g. spectral unmixing.

Expertise offered: 21 years expertise in dryland geomorphology and geo-ecology in northern, western and southern Africa, as well as South America and Australia. 22 years of Remote Sensing expertise, at various NGO, companies and academic institutions in Germany (DLR Oberpfaffenhofen, IFG Offenbach, Univ. of Wuerzburg) and South Africa (Remote Sensing co-ordinator at the Univ. of Pretoria, Dept of Geography, Geoinformatics & Meteorology), with respective networking contacts, workshop attendance and other training. Remote-sensing based consulting experience (geomorphology, geo-ecology, geology) in drylands since 1997. Supervision of numerous Remote-Sensing based postgraduate projects. Most of my academic research is based on, or supported by, Remote Sensing data and processing techniques, since 1984. Numerous contacts with GOs, NGOs and companies and individuals working with Remote Sensing data.

Previous FP involvement: None

Consortium status: so far, contacts to academic colleagues from various universities involved in dryland and land degradation research

Expertise sought: Scientific experience in: dryland geomorphic history, dryland geomorphic processes, holistic landscape assessment. Technical: digital data processing methods of passive and active remote sensing data.

Related projects: None