

# GEO2TECDI

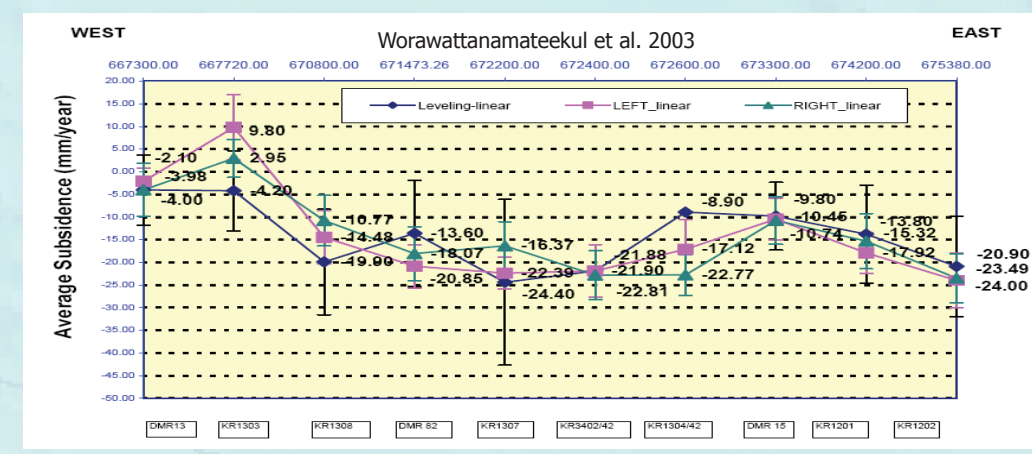
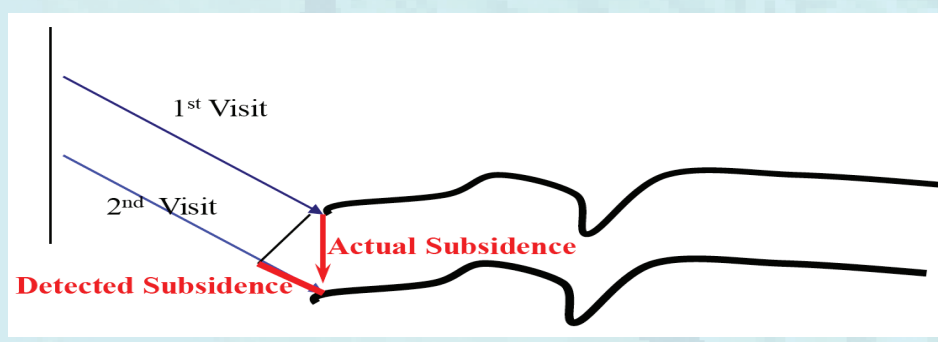
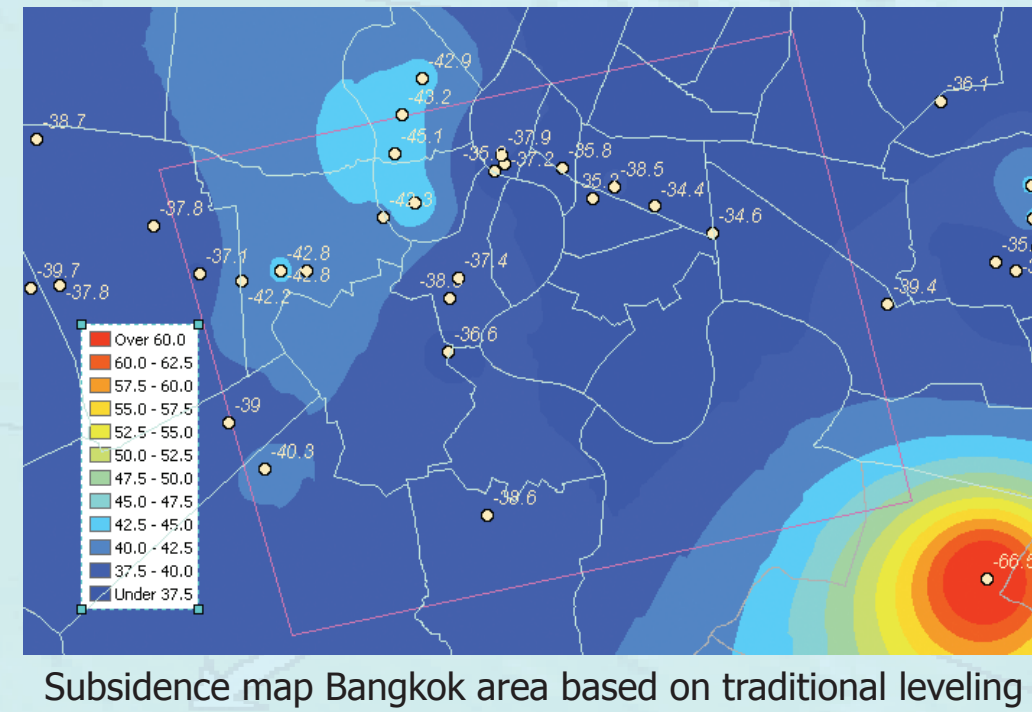
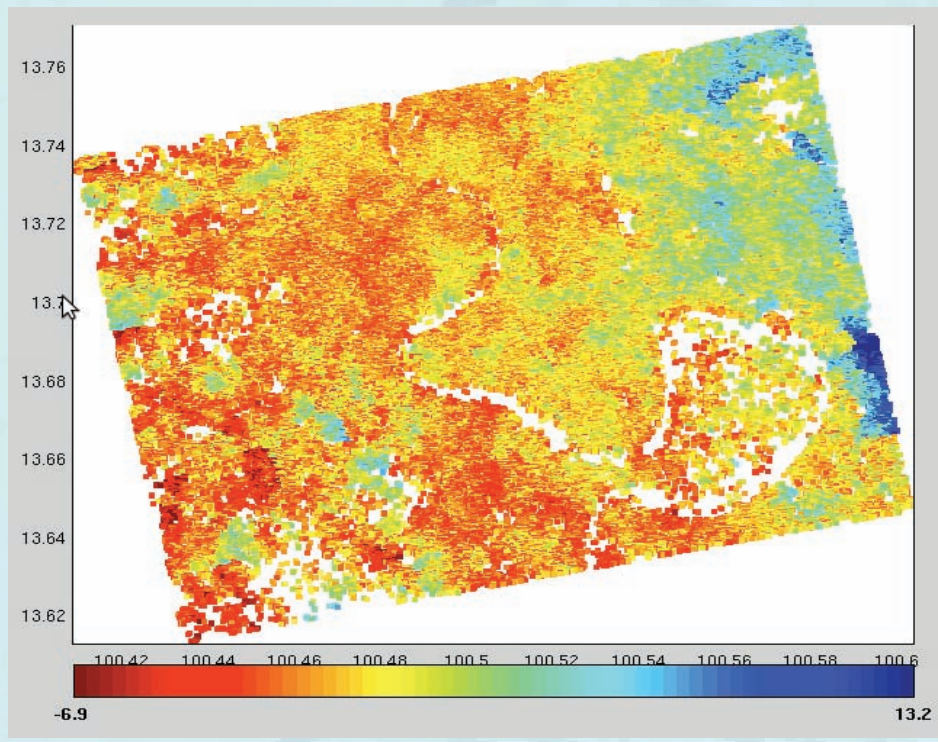
Geodetic Earth Observation Technologies for Thailand: Environmental Change Detection and Investigation

Marc Naeije<sup>†</sup>, Wim Simons<sup>†</sup>, Itthi Trisirisatayawong<sup>‡</sup>, and Chalermchon Satirapod<sup>‡</sup>

<sup>†</sup>DEOS/TU Delft - Faculty of Aerospace Engineering  
Kluyverweg 1 - 2629 HS Delft - The Netherlands

<sup>‡</sup>Department of Survey Engineering - Chulalongkorn University - Pathumwan, Bangkok, 10330 - Thailand

## Interferometric SA Radar (InSAR)



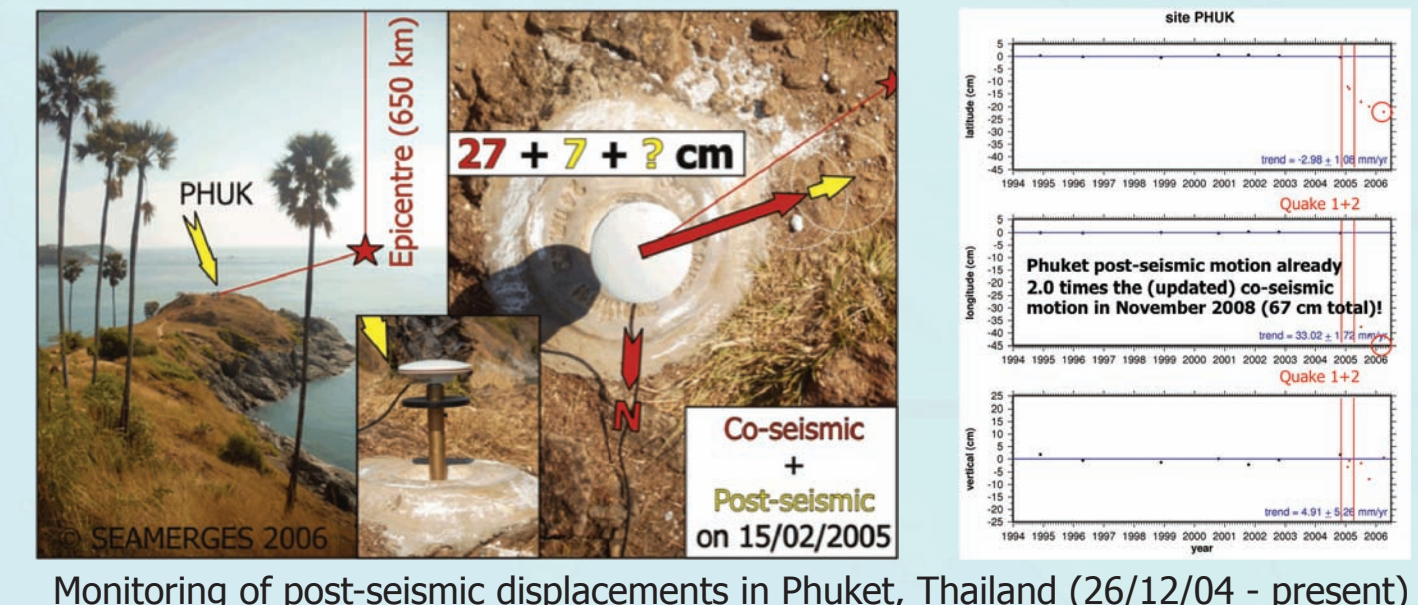
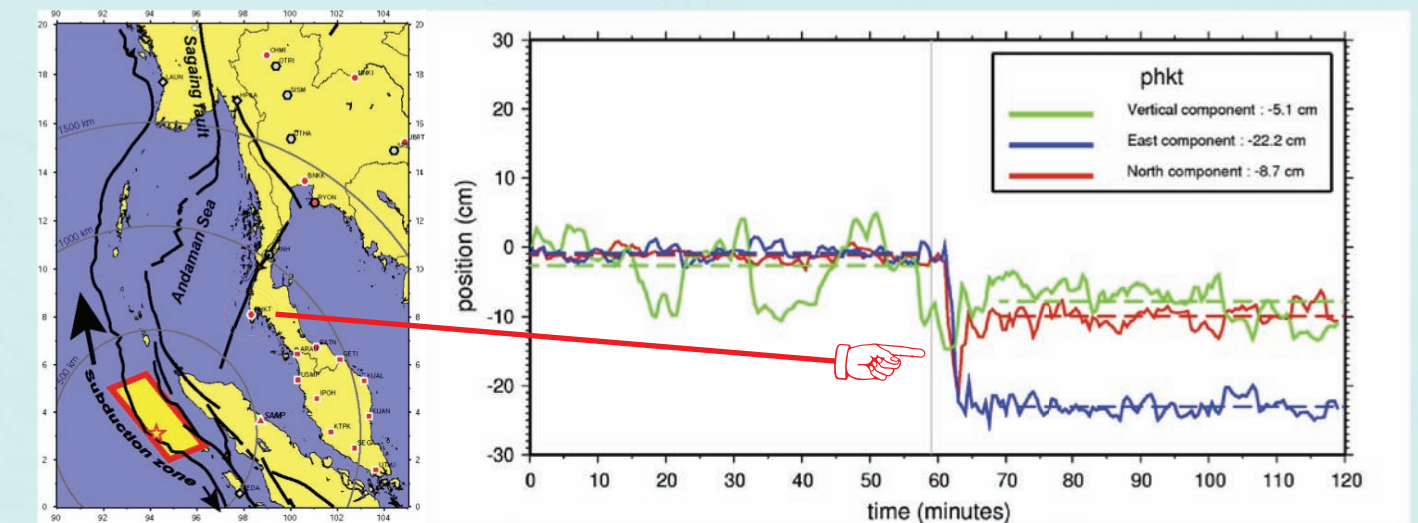
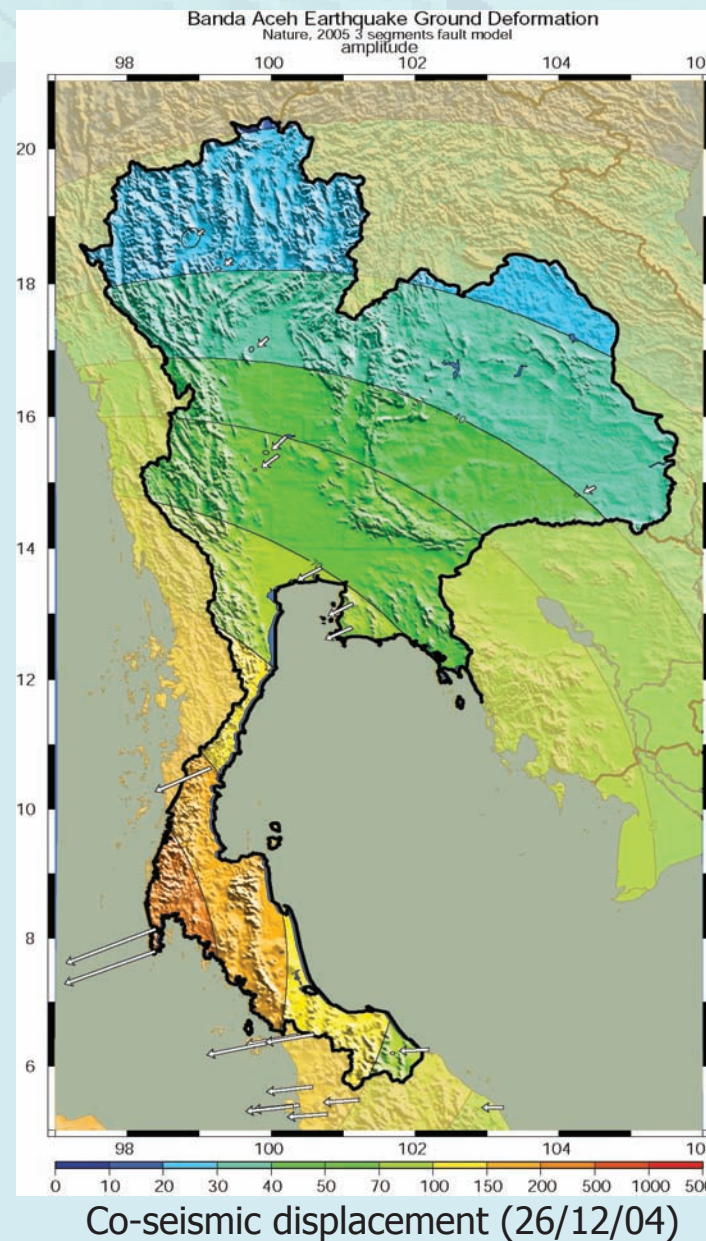
**Summary** The EU financed GEO2TECDI project aims to enhance skills and Thailand-EU joint research capabilities of Thai researchers in applying and exploiting the space geodetic techniques Global Navigation Satellite System (GNSS), Interferometric Synthetic Aperture Radar (InSAR) and Satellite radar Altimetry (SALT), for the detection, monitoring and modeling of absolute land surface motion and deformation due to tectonic processes, land subsidence and sea level trend from global warming. Theoretical knowledge and expertise from EU researchers from TU Delft (Netherlands), ENS (France) and TU Darmstadt (Germany) are mobilized to raise Thai research capability and capacity to international standards. It consists of human resources development and joint research activities, including advanced earth-observation courses taught at Chulalongkorn University in Bangkok and research workshops.



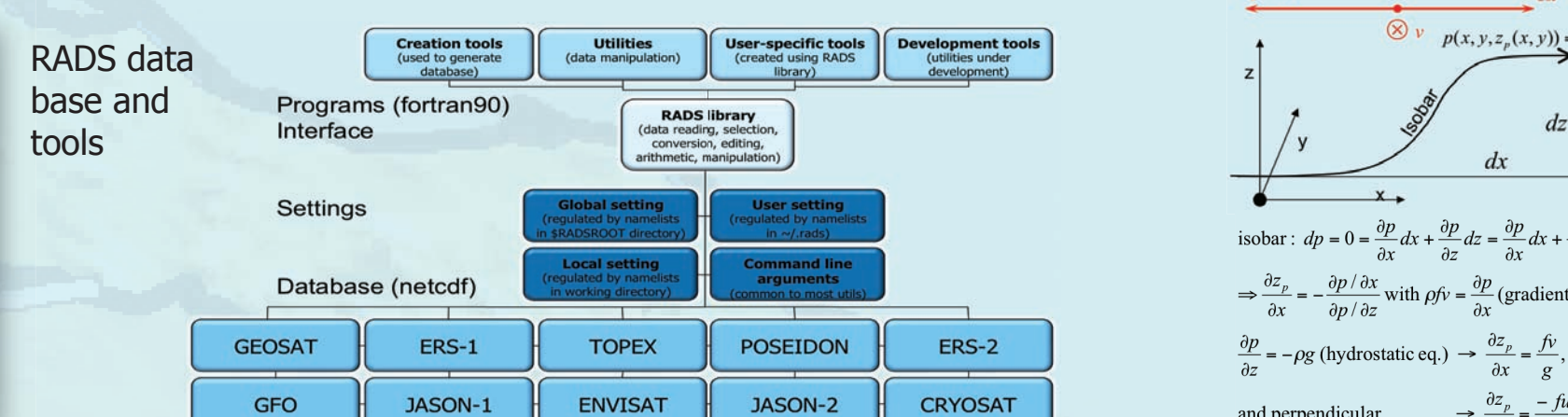
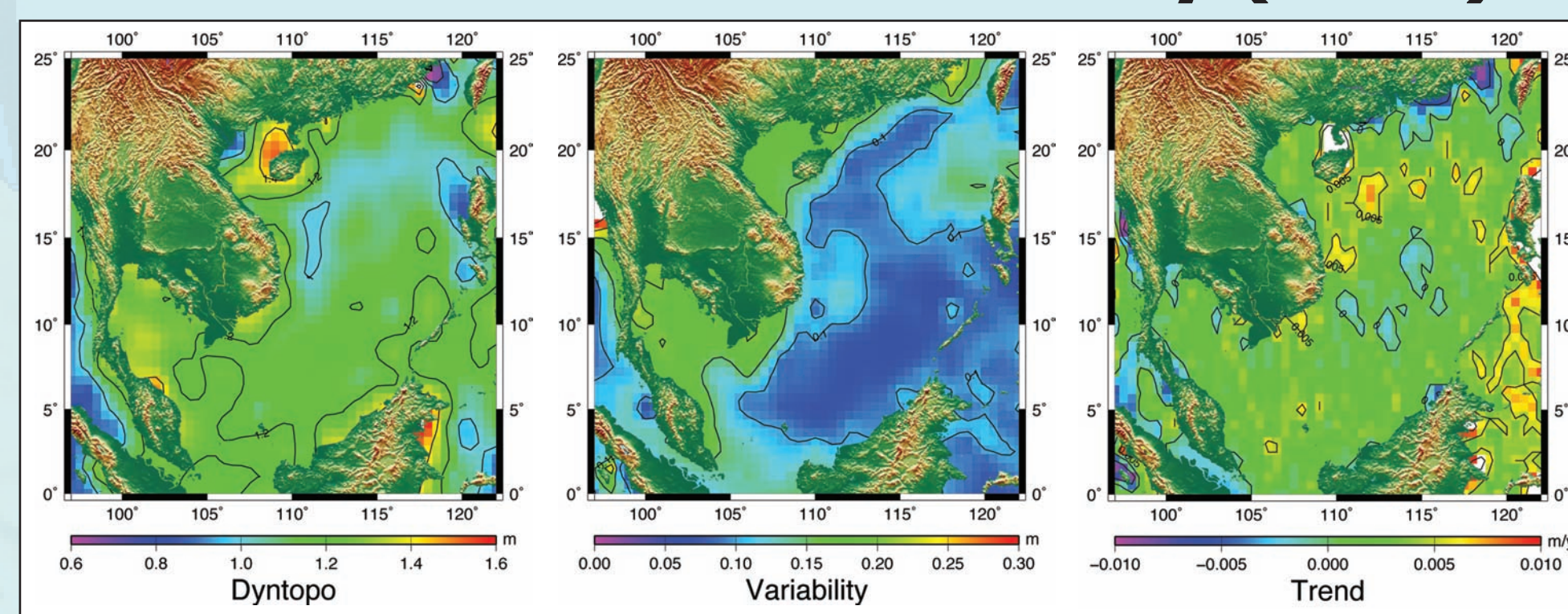
**Rationale** The Bangkok area is the heart of Thailand in socioeconomic terms. Geographically, this area is just 1 meter above sea level, which means that the combined effect of land subsidence and sea level rise will lead to more frequent and sustained flooding, diminishing the protection by dikes. This poses a serious threat to Thai society and economy. Furthermore Bangkok is on the move due to co- and post seismic motion as result from recent earthquakes (like Banda Mw=9.2, 2004), and is also not free from earthquake risk itself because of nearby active faults. Beneficiaries of GEO2TECDI are academic staff and students from Chulalongkorn and Chiangmai University and staff from the HD, RTNA, RTSD and GISTDA institutes. They are the potential employers of the trained students forming links among all involved. Also, Thai decision and policy makers will gain access to information on scale and impact of the hazards enabling appropriate mitigation.

**Sustainability** The ultimate goal is Thai society benefiting as a whole, being better informed by the media about present and future environmental hazards. The Thai-EU and Thai-Thai cooperation established will last beyond the project. Clear sustainable benefits are cooperation among one another, cooperation with EU partners, exposure to the international scientific community and multi-disciplinary project experience. The impact is multiplied once students graduate, work in many parts of Thai society and transfer the knowledge to future peers and employers.

## Global Navigation Satellite System (GNSS)



## Satellite radar ALTimetry (SALT)



$$\frac{\partial p}{\partial x} = -\rho g$$

$$\frac{\partial p}{\partial z} = -\rho g$$

$$\frac{\partial p}{\partial x} = -\rho g \cos \alpha$$

$$\frac{\partial p}{\partial z} = -\rho g \sin \alpha$$

$$\frac{\partial p}{\partial x} = -\rho g \cos \alpha$$

$$\frac{\partial p}{\partial z} = -\rho g \sin \alpha$$



**Means** The software packages that are introduced and Thai researchers will use for processing and analysis of GNSS (GPS and in the future Galileo), InSAR and SALT data in this project are Bernese, GIPSY, DORIS and RADS: almost all developed by European universities. Also, most of the SAR images needed to investigate study areas in Thailand are acquired by European satellites like ERS-1, ERS-2 and Envisat. In addition, SALT data also mainly comes from EU and EU-US missions like again Envisat, and TOPEX and JASON. RADS, the renowned Radar Altimeter Database System is an initiative by TU Delft/DEOS, Altimetrics LLC, and NOAA.

More details can be found on the web site <http://www.sv.eng.chula.ac.th/geo2tecdi>