Remote sensing & Modeling of Water related disasters/issues in Vietnam

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LAB REMOSAT

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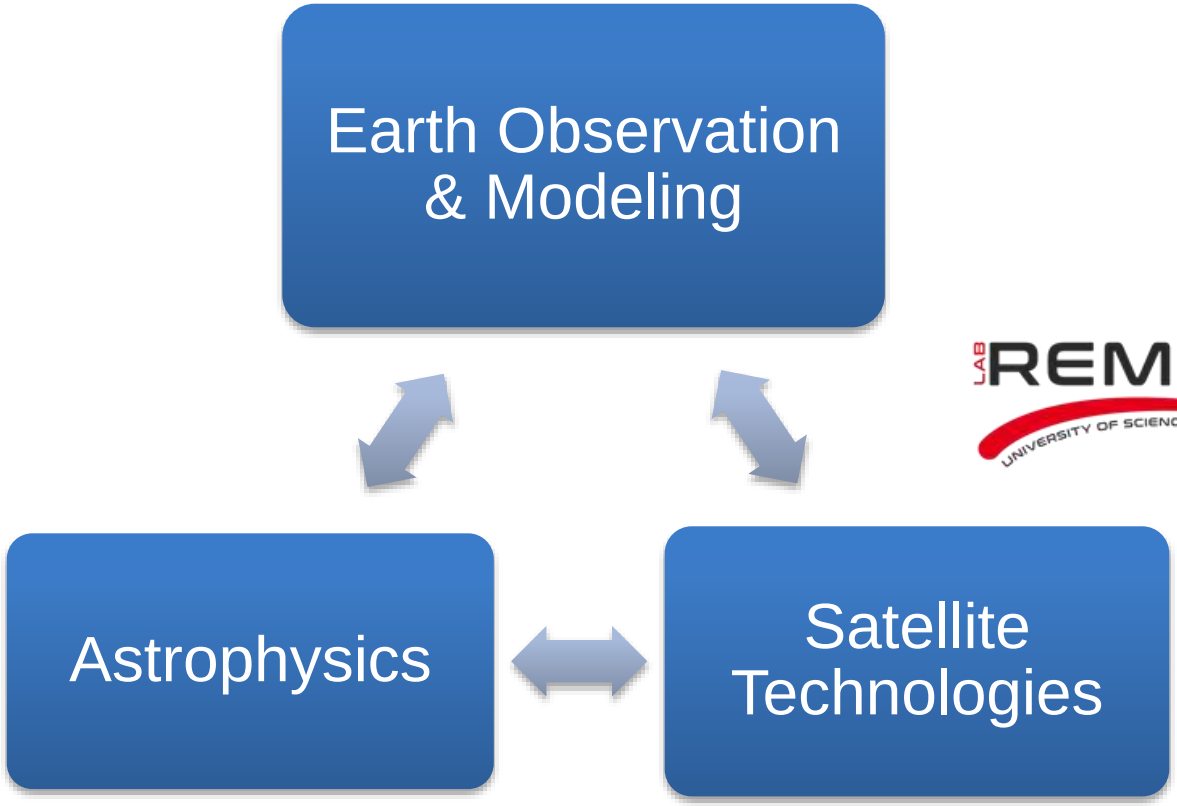
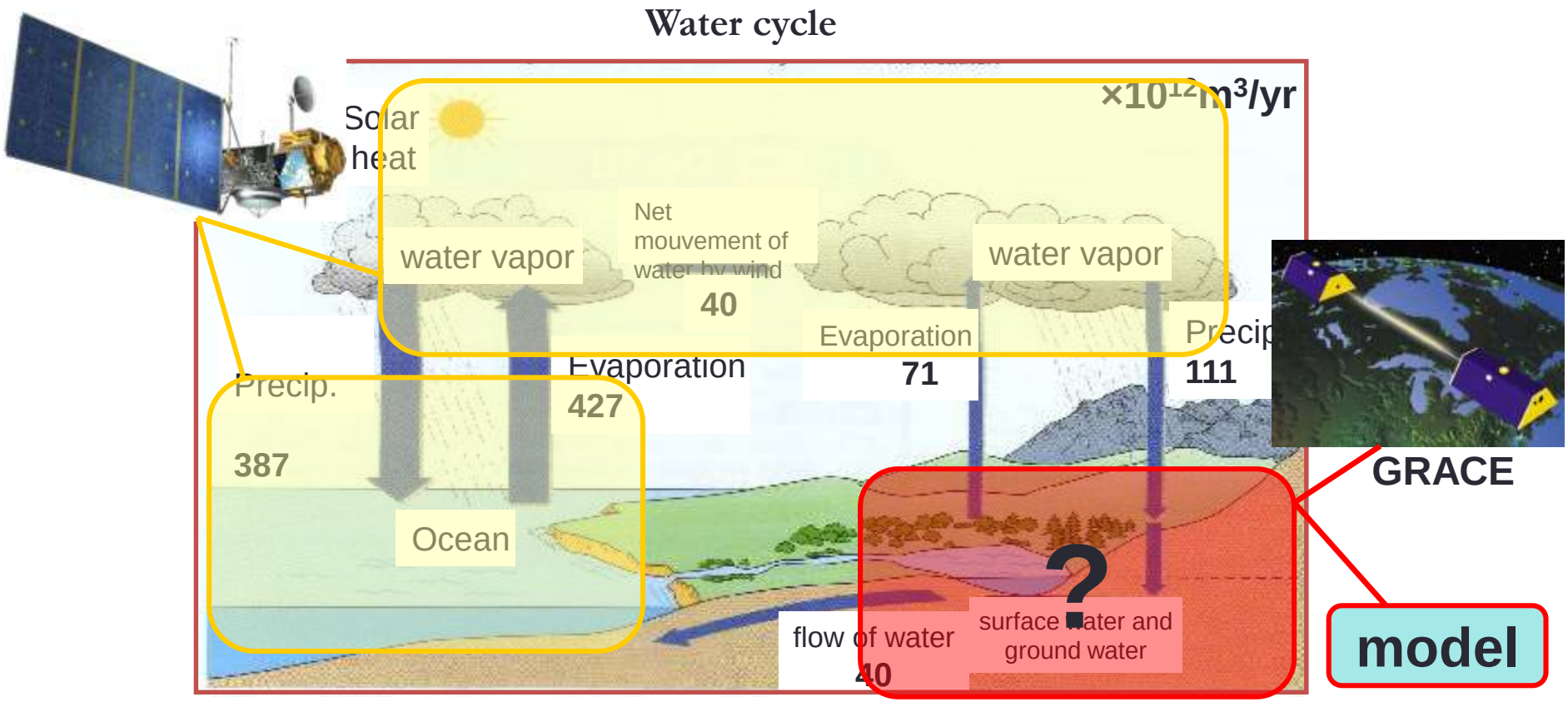
Research topics



Research Topic #1

Study the variability of hydrologic cycle by using numerical models and observations.

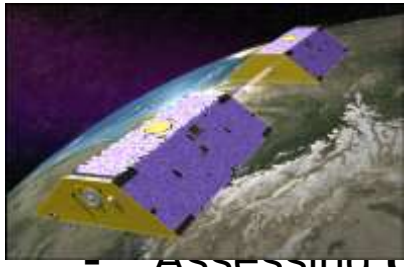


Water exchanged volume estimated by Baumgartner et Reichel (1975)

Ngo-Duc et al., *2005a,b,c;…; Pappenberger et al.*, IJOC, 2010; *Hotaek et al., J.Clim. 2015*

Example

GRACE Mission (Gravity Recovery And Climate Experiment)



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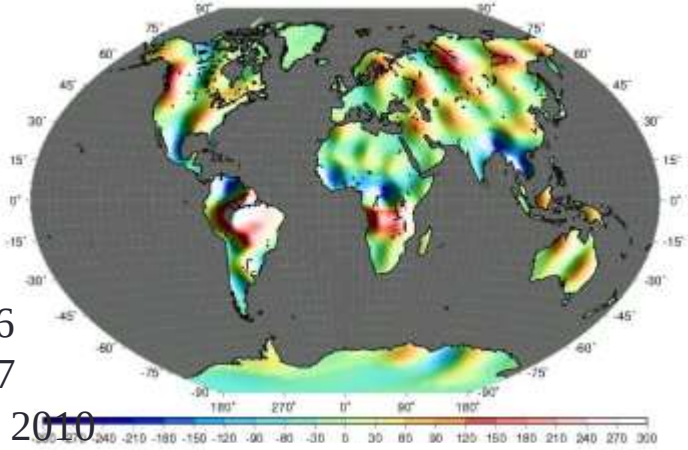
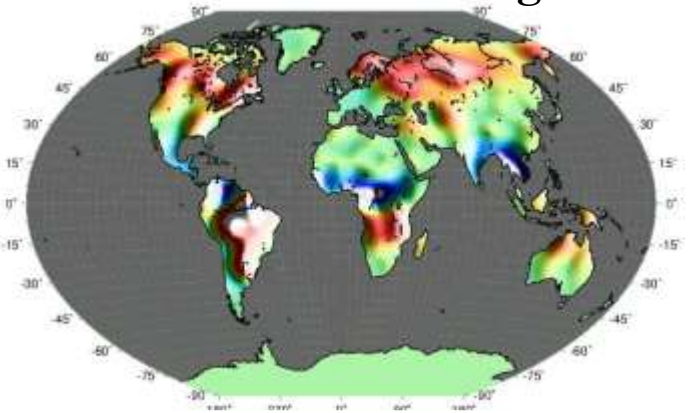
- Assessing **JI**
  - sensing

Ramillien et al., WRR,2006
Ngo-Duc et al., WRR, 2007
Pappenberger et al., IJOC, 2010

GRACE

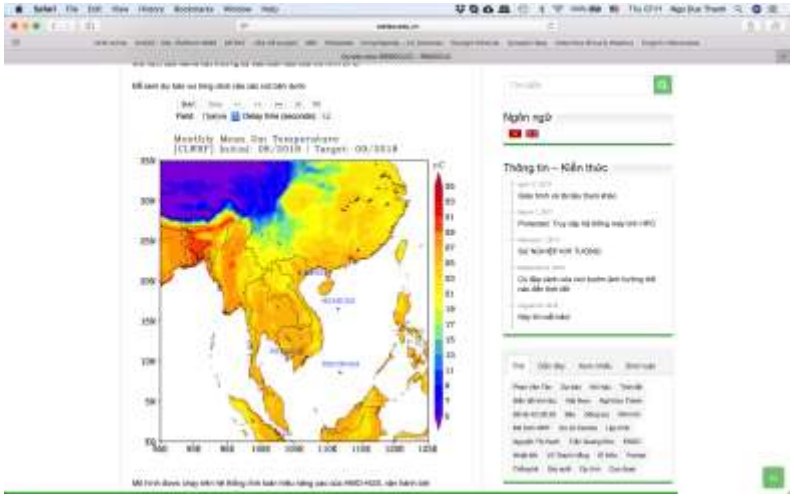


Model with routing

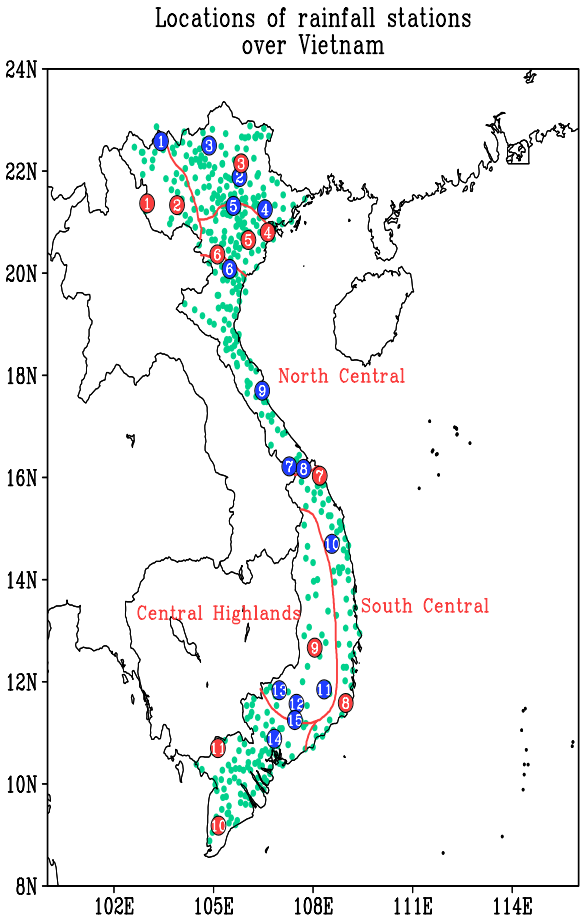


Seasonal variations of water (April/May – November 2002)

- **Short-term weather forecast and seasonal forecasts**
  - Linking with agriculture activities (coffee, rice), water management, …
  - Pesticide measurements in the red river delta system
  - Rain water harvest

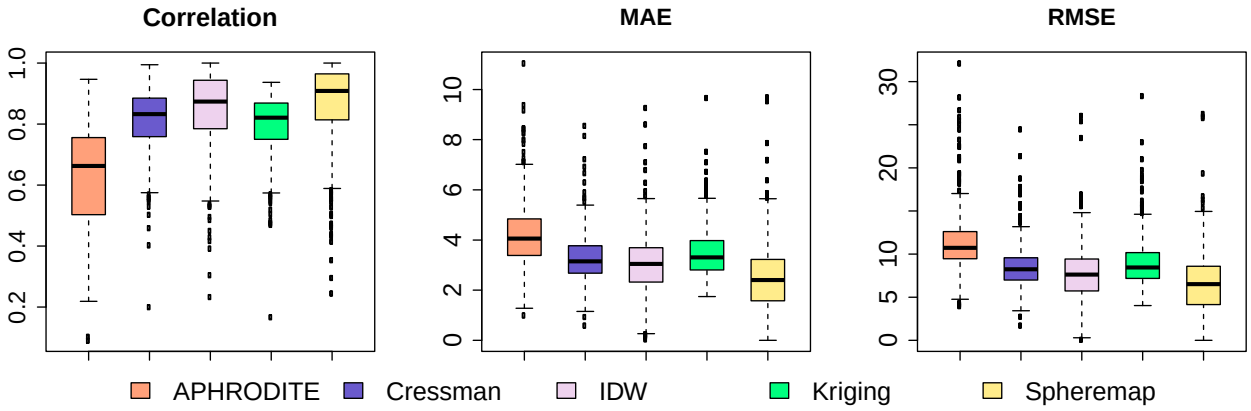


Vietnam Gridded Precipitation (VnGP) Dataset



(Nguyen, Ngo-Duc et al., SOLA, 2016)

- 481 stations
- Daily observations
- Resolution: 0.25º, 0.1º
- Period: 1980-2010



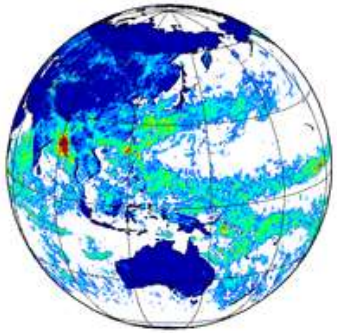
The VnGP dataset can be downloaded from the Data Integrated and Analysis System (DIAS), Tokyo University

http://dias-dmg.tkl.iis.u-tokyo.ac.jp/dmm/doc/VnGP_025-DIAS-en.html

Research Topic #2

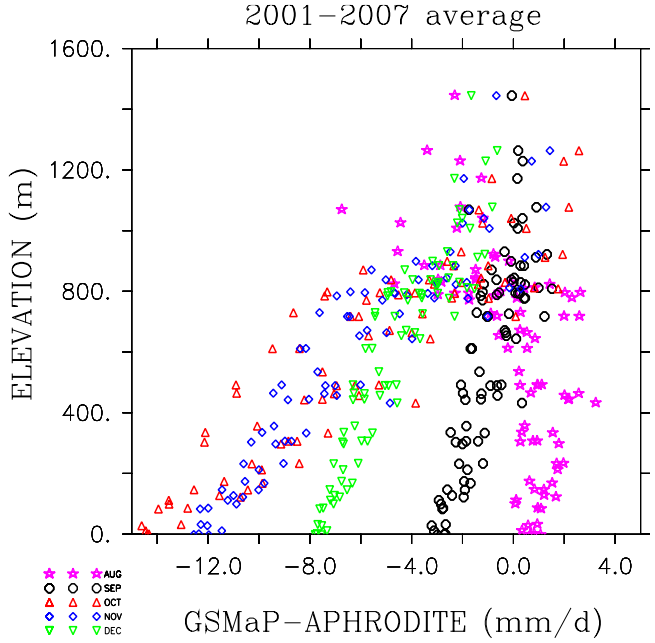
Satellite Data
REMOTE SENSING

Precipitation measurement from space?



- Real-time monitoring of precipitation
- Application for hydrological forecast & water management (dam control)
- Overcome the trans-boundary data issue

Satellite-derived products(eg. GSMaP)



- Satellite rainfall data should be bias corrected

Ngo-Duc et al., 2013,Hydro. Res. Lett.

Nguyen et al., 2016, SOLA

Trinh et al., 2018, under rivision

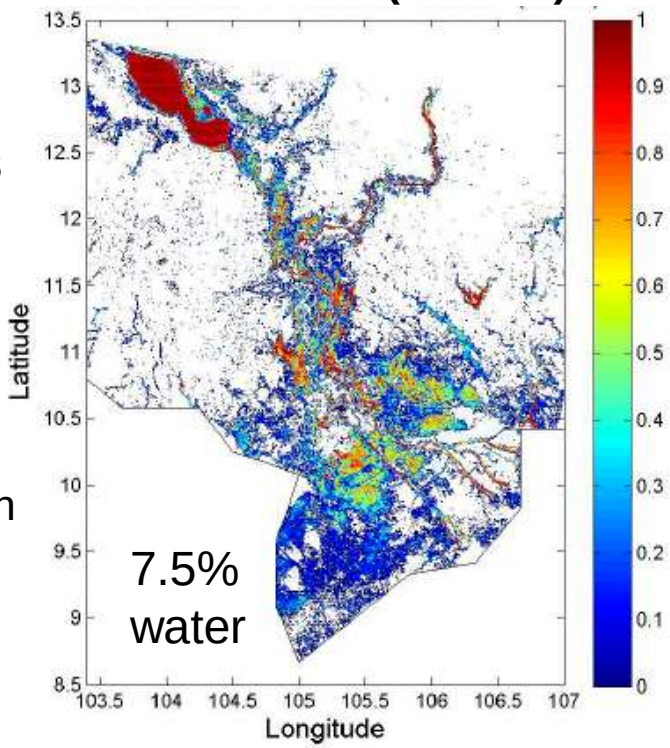
Mapping surface water

Satellite Data
REMOTE SENSING

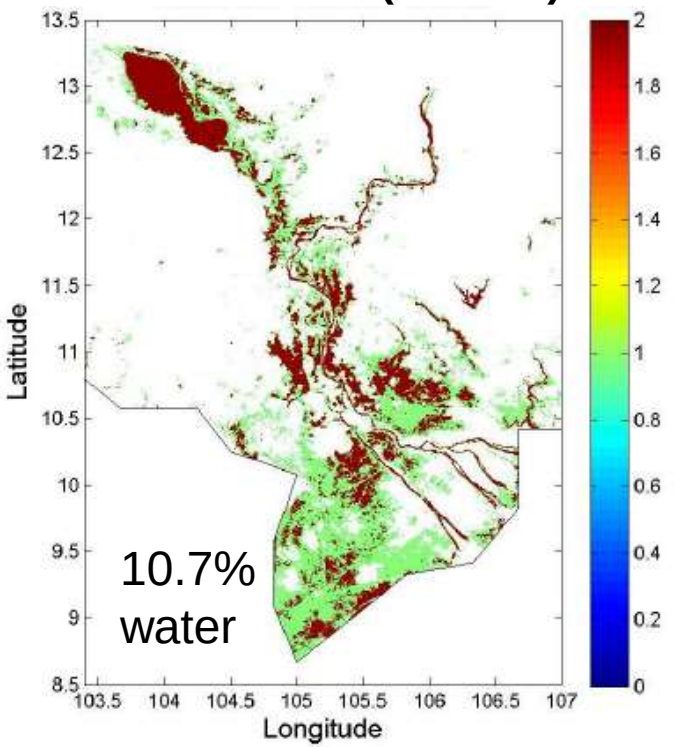
Surface water maps

77.5% spatial correlation

SAR Sentinel 1 (10/2015)



VIS/IR MODIS (10/2015)



Pham et al. (2017a,b)

Research Topic #3

Climate change & Regional scale modelling

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Middle East

Last Updated: Monday, 14 August 2006, 22:02 GMT 23:02 UK

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'More disasters' for warmer world

Rising temperatures will increase the risk of forest fires, droughts and flooding over the next two centuries, UK climate scientists have

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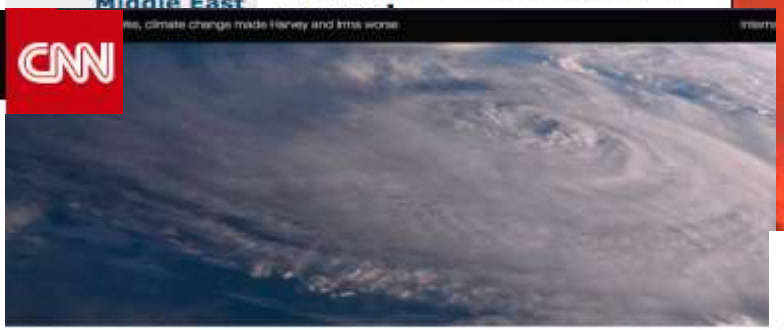
Science & Environment

Climate change to boost summer flash floods, says study

Flash flooding struck the north Cornwall village of Boscastle in the summer of 2004

CNN



Yes, climate change made Harvey and Irma worse

VNEXPRESS

Thứ bảy, 29/10/2011, 12:36 (GMT+7)

Đông Nam Á bị ảnh hưởng nặng do biến đổi khí hậu

Việt Nam là một trong năm nước Đông Nam Á có nguy cơ hứng chịu tác động khắc nghiệt nhất của hiện tượng ấm lên toàn cầu.

The New York Times

Hotter, Drier, Hungrier: How Global Warming Punishes the World's Poorest

Research Topic #3

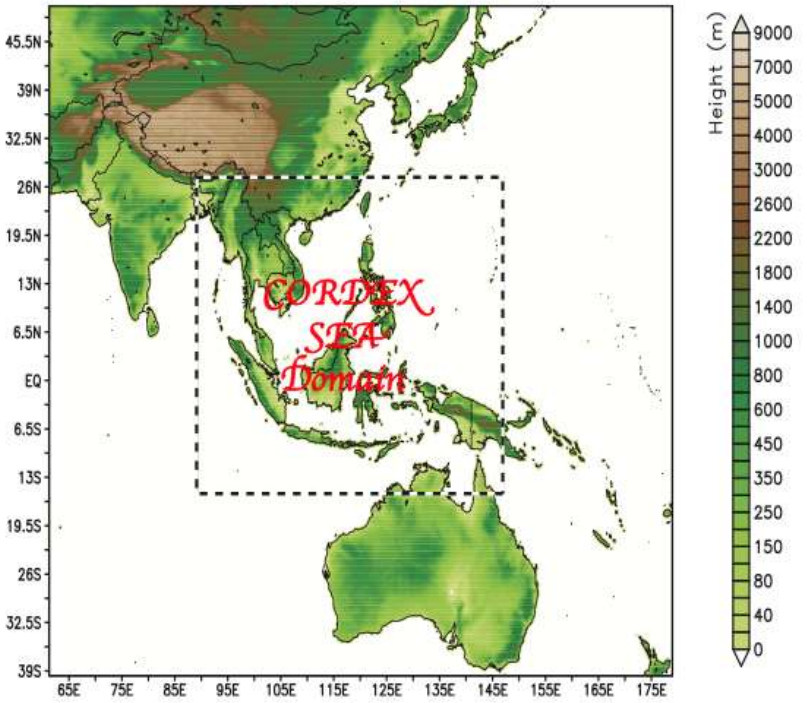
Climate change & Regional scale modelling

- **Research domain:** Vietnam, Southeast Asian countries

CORDEX Southeast Asia (http://www.ukm.my/seaclid-cordex/)

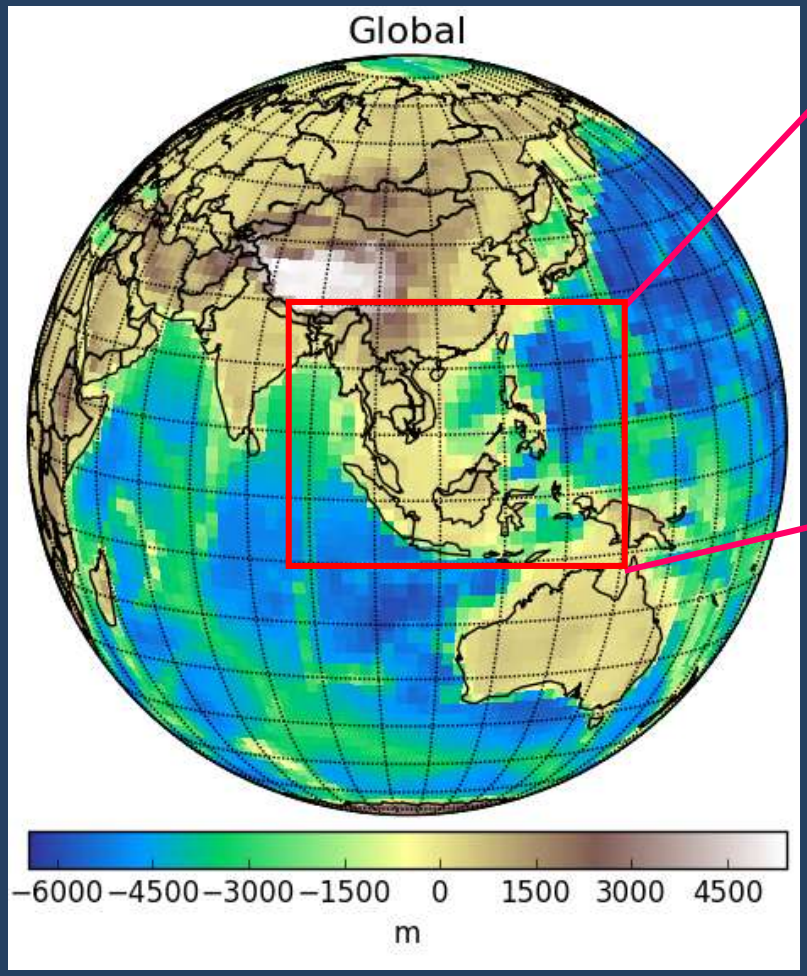
CORDEX-SEA

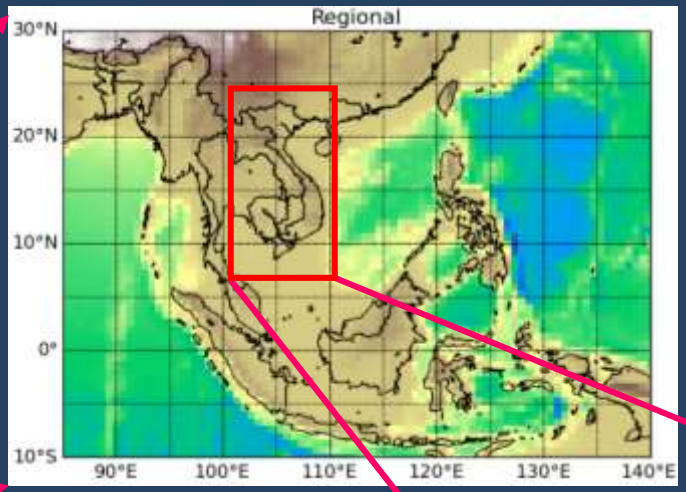
- Downscaling CMIP5 GCMs to 25 km, then to 5km
- Sharing data & resources
- Capacity building
- Publications from the SEA region

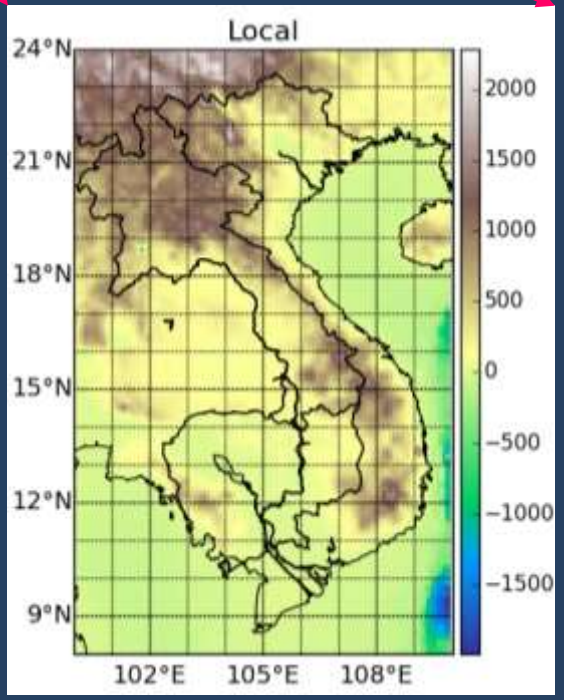


Ngo-Duc et al., Clim.Res., 2014
Ngo-Duc et al., IJOC, 2017,
Juneng et al., Clim.Res., 2016,
Ngo-Duc et al., S.M. 2012
Faye et al., IJOC, 2017; Tangang et al., IJOC 2018

Climate Change Simulations at multiple spatial scales

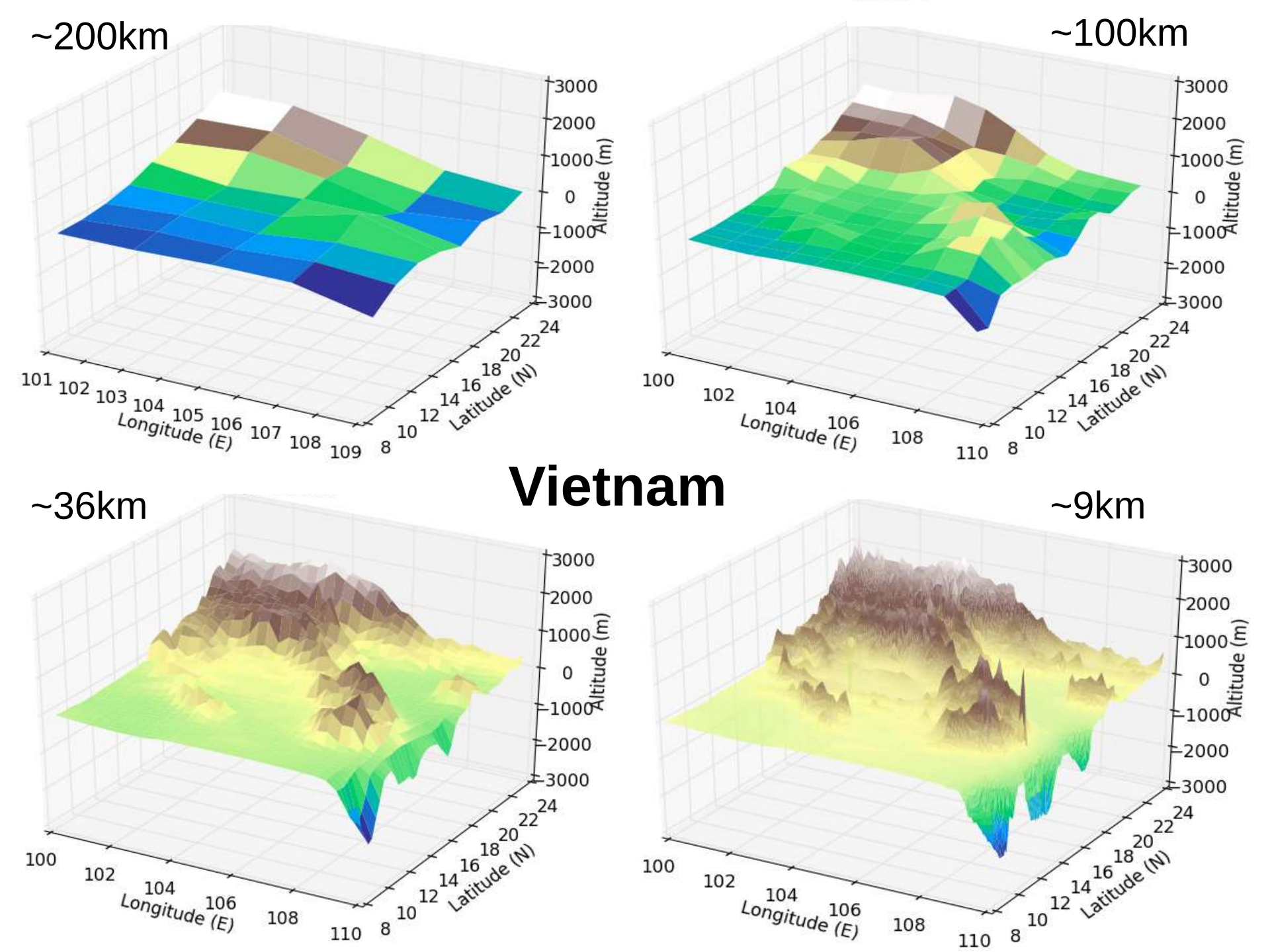






Regional climate modelling

- Added Values (fine scale forcing, mesoscale circulation, **extremes**)
- Better simulation → Better Climate Change Projections?!


~200km
~100km
Vietnam
~36km
~9km
Altitude (m)
3000
2000
1000
0
1000
2000
3000
Longitude (E)
Latitude (N)
101 102 103 104 105 106 107 108 109
100 102 104 106 108 110
8 10 12 14 16 18 20 22 24

Perspectives

- NBS for Water security ←how remote sensing & modeling can contribute?
- *How can we link to each other?*

Nhue river (Hanoi, September 2018): water sources for rice paddy field irrigation

Publications in 2018

1. Ndikumana, E., Ho Tong Minh, D., **Dang Nguyen, H.T.**, et al., 2018: Estimation of Rice Height and Biomass Using Multitemporal SAR Sentinel-1 for Camargue, Southern France. Remote Sens, 10, 1394. https://doi.org/10.3390/rs10091394
2. Tangang, F., .. **T. Ngo-Duc** et al., 2018: Future changes in annual precipitation extremes over Southeast Asia under global warming of 2°C. APN Science Bulletin, 8(1). https://doi.org/10.30852/sb.2018.436
3. Luo, P.P., D. Mu, H. Xue, **T. Ngo-Duc**, et al. 2018:An Assessment of flood inundation in Hanoi Central Area, Vietnam under historical and future extreme rainfall, *Scientific Reports*, 8: 12623. https://doi.org/10.1038/s41598-018-30024-5
4. Bablet, A., **P.V.H. Vu**, et al. 2018: MARMIT: A multilayer radiative transfer model of soil reflectance to estimate surface soil moisture content in the solar domain (400–2500 nm), *Remote Sensing of Environment*, 217, 1-17, https://doi.org/10.1016/j.rse.2018.07.031.
5. Phan-Van, T., ..**T. Ngo-Duc**, 2018: Evaluation of the NCEP Climate Forecast System and Its Downscaling for Seasonal Rainfall Prediction over Vietnam, *Weather and Forecasting*, 33, 615–640, https://doi.org/10.1175/WAF-D-17-0098.1
6. **Nguyen, TH.**, SK. Min, S. Paik, and D. Lee, 2018: Time of emergence in regional precipitation changes: an updated assessment using the CMIP5 multi-model ensemble, *Clim. Dyn.*, https://doi.org/10.1007/s00382-018-4073-y
7. P. Natoli, M. Ashdown, ..., **D.T. Hoang**, ..., 2018: Exploring cosmic origins with CORE: mitigation of systematic effects, Journal of Cosmology and Astroparticle Physics, http://iopscience.iop.org/article/10.1088/1475-7516/2018/04/022/meta
8. J. Delabrouille, ..., **D.T. Hoang**, ..., 2018: Exploring Cosmic Origins with CORE: Survey requirements and mission design, Journal of Cosmology and Astroparticle Physics, http://iopscience.iop.org/article/10.1088/1475-7516/2018/04/014/meta
9. **H. Phan**, H. Halloin, P. Laurent, 2018: IGOSat - A 3U Cubesat for measuring the radiative/electrons content in low Earth orbit and ionosphere, *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, ISSN 0168-9002, https://doi.org/10.1016/j.nima.2018.03.065
10. Tangang, F., .., **T. Ngo-Duc** , .., 2018: Future changes in annual precipitation extremes over Southeast Asia under global warming of 2°C. APN Science Bulletin, 8(1). https://doi.org/10.30852/sb.2018.436
11. Tangang, F., ...,**T. Ngo-Duc**, et al., 2018: Projected future changes in mean precipitation over Thailand based on multi-model regional climate simulations of SEACLID/CORDEX Southeast Asia, accepted
12. Trinh-Tuan, L., J. Matsumoto, **T. Ngo-Duc**, et al., 2018: Evaluation on Satellite Precipitation Products over Central Vietnam, *under revision*.
13. Nodzu, M.I., J. Matsumoto, L. Trinh-Tuan, **T. Ngo-Duc**, 2018: Estimate performance of Global Satellite Mapping of Precipitation and its dependence on wind over Northern Vietnam, *under revision*.
14. Trinh-Tuan, L., **T. Ngo-Duc***, J. Matsumoto, F.T. Tangang, L. Juneng, F. Cruz, G. Narisma, J. Santisirisomboon, T. Phan-Van, D. Gunawan, E. Aldrian, 2018: Application of Quantile Mapping Bias Correction for Mid-future Precipitation Projections over Vietnam, under revision.