



INTERNATIONAL SCHOOL FOR GEOSCIENCE RESOURCES (IS-Geo)
KOREA INSTITUTE OF GEOSCIENCE AND MINERAL RESOURCES (KIGAM)

PUBLIC CUSTOMIZED TRAINING COURSE ON Regional Quaternary Paleoclimatic and Paleoenvironmental Change

The **International School for Geoscience Resources** of KIGAM presents an intensive training course on **Regional Quaternary Paleoclimatic and Paleoenvironmental Change**. The course will take place at the Ara room of International School for Geoscience Resources of KIGAM in Daejeon (Korea) in **May 12 to 15, 2015** and will include the following topics.

Topics	Date	Instructor
Day 1. Modern aeolian environments		
Topic 1. Climatic controls on dust generation and transport	May 12	Dr. Jan-Berend Stuut (NIOZ and MARUM, Netherlands)
Topic 2. Present-day Saharan dust		
Topic 3. Exercise: working with HYSPLIT		
Day 2. Past aeolian environments		
Topic 1. Mineral dust as proxy for past environments	May 13	
Topic 2. Past Saharan- and Namibian dust		
Topic 3. Past and Present Australian dust		
Day 3-1. Ongoing dust studies	May 14	Dr. Kana Nagashima (JAMSTEC, Japan)
Topic 1. Modern Saharan dust: research at MARUM & NIOZ	(Morning)	
Day 3-2. Eolian dust and millennial-scale climate change during the late Quaternary		
Topic 1. Regional environment of dust process in East Asia	May 14 (Afternoon)	
Topic 2. Provenance study of eolian dust –physical and chemical characters of quartz-		
Topic 3. Millennial-scale provenance changes of eolian dust in marine sediments		
Day 4. High-resolution dust record from annually-laminated lake sediments		
Topic 1. Techniques for high-resolution study using lacustrine/marine sediments	May 15	
Topic 2. Regional environment of L. Suigetsu		
Topic 3. How to extract eolian dust information from the lake sediments?		



COURSE INFORMATION

• Agenda

- This course will provide an introduction to aeolian sediments and their climatic significance. It will deal with modern aeolian systems and with mineral-dust transport from source to sink. Students are expected to have read the provided papers on the case studies.
- This course will provide also an introduction to paleoclimate researches of Asian region using eolian dust in marine/lacustrine sediments with decadal to millennial timescales.

• Course Covered

- Mineral dust is a key player in the Earth system and several scientific disciplines study dust in its various aspects. Students will hear about what causes mobilisation of mineral dust in its various source areas, transport and deposition and all its consequences.
- The lecture series will start with a general introduction into aeolian systems followed by a number of case studies that have been published in the scientific literature. Finally, ongoing research will be presented.
- Regional environment of dust process in East Asia
- Provenance study of Asian dust using mineralogical features
- Millennial-scale coupling of the westerly jet and East Asian summer monsoon
- Introduction to high-resolution study using lacustrine and marine sediments

• Course Requirements: Prerequisite

- The students are expected to have read the provided papers (N=9, see list)
- General computer skills are required for the practical on Tuesday afternoon
- Knowledge of basic sedimentology and mineralogy will help but is not necessary.
- Knowledge of basic paleoclimatology especially for the late Quaternary is required.

• Who should Attend?

- This course is designed for earth-science students interested in aeolian environments, paleo-climate reconstructions and climate-impacts of dust.
- This course is designed for scientists or engineers who are interested in Asian dust and/or climate changes during the late Quaternary.

- **Summary of topic contents and learning objectives**

Eolian dust has profound impacts on global climate. On the other hand, eolian dust within sediments has been used as a tracer to know past atmospheric circulation changes. In East Asia, dust-emission, transport, and deposition processes are strongly correlated with Asian monsoon intensity and westerly jet path, so the Asian dust in sediments is expected to record past monsoon-westerly jet changes. Here, the basic knowledge of the regional dust processes and dust provenance study using sediment cores will be overviewed, and centennial- to millennial-scale Asian monsoon and westerly jet changes will be discussed.

- **Day 1.** Modern aeolian environments

- 10:00-11:00 Introduction: planetary wind system, aeolian transport
- 11:10-12:10 Climatic controls on dust generation and transport
- 13:30-14:30 Case study: present-day Saharan dust [Stuut et al., 2005, JGR, [see literature list](#)]
- 14:40-15:40 Exercise: HYSPLITT, introduction
- 15:50-16:50 Exercise: HYSPLITT, backward trajectories
- 17:00-18:00 Exercise: HYSPLITT, forward trajectories

- **Day 2.** Past aeolian environments

- 10:00-11:00 Case study: Late Quaternary Saharan dust [Mulitza et al., 2008, Paleoceanography]
- 11:10-12:10 Case study: Late Holocene Saharan dust [Mulitza et al., 2010, Nature]
- 13:30-14:30 Case study: Provenance of Saharan dust [Meyer et al., 2011, G³ & 2013, Aeolian Res.]
- 14:40-15:40 Case study: Late Quaternary Namibian dust [Stuut et al., 2002, Marine Geology]
- 15:50-16:50 Case study: Late Quaternary Australian dust [Stuut et al., 2014, Quaternary Sc. Rev.]
- 17:00-18:00 Case study: Modern Australian dust storms [De Deckker et al., 2008, G³ & 2014 AR]

- **Day 3-1.** Ongoing dust studies

- 10:00-11:00 Modern Saharan dust: ongoing research at MARUM – Bremen, Germany
- 11:10-12:10 Transatlantic transport of Saharan dust: ongoing research at NIOZ, the Netherlands

- **Day 3-2.** Eolian dust and millennial-scale climate change during the late Quaternary

The regional environment of dust processes in East Asia will be overviewed with emphasis on its differences between the Taklimakan Desert and the Gobi in southern Mongolia. Past Asian monsoon and westerly jet changes, especially millennial-scale variations during the last glacial period and the Holocene, will be also discussed from the provenance study (Taklimakan vs. Gobi) of eolian dust using marine sediments.

- 13:30-14:30 Regional environment of dust process in East Asia
- 14:40-15:40 Provenance study of eolian dust –physical and chemical characters of quartz-
- 15:50-16:50 Millennial-scale provenance changes of eolian dust in marine sediments

- **Day 4.** High-resolution dust record from annually-laminated lake sediments

Techniques for high-resolution study using lacustrine/marine sediments will be overviewed focused on the depth control of sediments and precise age model construction. Recent studies using annually-laminated sediments from Lake Suigetsu in Central Japan will be overviewed connecting field observations and analyses of lake sediments.

- 10:00-11:00 Techniques for high-resolution study using lacustrine / marine sediments
- 11:10-12:10 Regional environment of Lake Suigetsu
- 13:30-14:30 How to extract eolian dust information from the lake sediments?

About the instructor – *Dr. Jan-Berend Stuut*

- Degrees:
PhD, Utrecht University, the Netherlands, 2001
Master's eqv. degree in Geology, Utrecht University, the Netherlands, 1996
- Positions:
2012 - Present Senior scientist at NIOZ and MARUM
2009 - 2012 Tenure-track scientist at NIOZ
2002 - 2009 Post-doctoral scientist at RCOM and MARUM, Bremen
2001 – 2002 Laboratory manager at VU Amsterdam
1997 – 2001 PhD student at Utrecht University and NIOZ
- Research work on:
Paleoclimate studies of desert regions
Present-day dust dispersal patterns
Marine environmental effects of dust deposition
Particle fluxes
The role of the Southern Hemisphere in global climate

About the instructor – *Dr. Kana Nagashima*



- Dr. Kana Nagashima, a Research Scientist in the Research and Development Center for Global Change (RCGC), Japan Agency for Marine-Earth Science and Technology (JAMSTEC). My main research theme is the Asian monsoon and westerly jet variations and the connections based on eolian dust records in marine/lake sediments. For the purpose, I am interested in the development of dust-provenance tracing method using chemical and physical parameters of quartz.