Day 2, Friday 20 March 2015

Chairs: Ed Cook, Juerg Luterbacher and Xumemei Shao

> **Needed data for P reconstruction**

Introduction by Ed Cook.
Most of the Asian data are from tree rings.

* Location of data: Data from periphery are very important. But the reality is that proxies are where you find them
* Types: high resolution and well dated desirable. But time limitation - no more time to generate new records.
* Types 2: Everything with a climate signal is important, ideally the record can be calibrated.
* Types 3: What is the climate signal? Annual vs seasonal. Global annual reconstruction from tree ring are unrealistic. Other proxies might be better for that purpose.
* Target variables to reconstruct:

Temperature reconstructions progressing well (report by reconstruction team).

Precipitation far harder, because it rains not always at same time as growth season. E.g. prior P winter in Mediterranean region. So large scale reconstructions are difficult.

Mixed signal targets: can be a solution. E.g. Summer PDSI can be reconstructed

Northern Hemisphere Drought Atlas in press. Some antiphase variability visible, such as in ENSO system, which was expected. This type of study will not be possible with P. But locally, P or streamflow studies are very important, and those should be the primary target for the Asia2k group.

> **Discussion**

In Asia main P season corresponds to summer monsoon growth season from tree ring. Especially isotopes data, which are available all over Asia. Good potential for local P reconstructions.

The Asia2k group should not focus on inter-regional products. That aspect will be discussed and targeted by the 2k Network as a whole (e.g. with the planned isotope data collection). Also, some of those questions will be studied with the existing and planned Drought Atlases.

In India, China and Japan a P reconstruction might actually be possible, even if only several centuries back. Tree rings, but also other proxy types, especially documentaries provide a very good basis for a Monsoon P reconstruction.

What index? Could be anything what models can use, not necessarily only P.

There exist excellent dryness/wetness indexes from China, going back 1000 years. Those data could be combined with the other types of records to produce a monsoon P reconstruction.

Huge potential for documentary data. Even better than tree rings in some regions.

Japan many documentary records were never open to international community, huge amount (Fujiki 19??). Those are in yearly resolution. Data can be contributed later this year, however they were not quantified yet (i.e. in climate classes).

If a full spatial coverage is not possible, the spatial extent could decrease with time according to the available data coverage.

→ One product should be a spatial monsoon P reconstruction, using (near-) annual multi-proxy indexes.

Documentary and tree ring important. But what other information on lower resolution? How could the non-annually resolved data be used? Maybe same approach as NAM2k did for Phase 1 of T recon? I.e. A high-resolution record supplemented/extended with a lower resolution record?
Other option is to use the lower-resolution records for verification purposes.

Index (non-calibrated) data also important and can be used for the reconstruction.

→ Lower resolution data must be collected. The reconstruction team will asses if those data can be combined to the high-resolution reconstruction, or if an independent lower-resolution reconstruction should be made.

> **Review of non-annual proxy data:**

Speleothems: Some records available from several regions. E.g. 3-4 papers for India. Naveen Ghandi and Shreyas Managave will prepare compilation of available cave deposit records.

Lake sediments: Some good records from Russia available. Olga Solomina will ask if those data can be contributed.

Japanese varved lakes: The represent mainly T. Sometimes flood events. Takeshi Nakatsuka will ask the Japanese varves community to compile the records.

Ice cores: Some records with good potential available, although time resolution probably rather low. Olga Solomina will ask Lonnie Thompson and others if their data can be contributed.

Glaciers: 15 time series of advance and retreat – "Index of glacial activity". Could be an important resource as independent record for the region. Olga Solomina to make a compilation.

Corals: Will be collected in the framework of the global isotopes collection.

Korea: 500-year long documentary records are available (Chenxi?).

Siberia: Many records, data but only in "raw" form. Not for direct use in this project.

Boreholes: Some records available from Russia. Olga Solomina to investigate.

Not much available from Pakistan.
Taiwan: Min-Te Chen: lot of historical literatures, records open and digitalized, but nothing that can be used yet for the 2k project (climate was not yet of interest). Maybe colleagues from China could help work on this for climate studies.

Mongolia: Good tree ring data. Edge lava field drought sensitive records,... Should be available later that year. Ed to investigate?

Marine records: Min-te Chen will make a compilation of the available records.

Lake sediments from Nepal: Narayan Gaire to compile records.

Lake level data not primary target for this project.

Tree rings from Russia: Dmitriy Ovchinnikov to compile records.

Documentaries (responsible for data compilation):
- India: Hemant Borgaonkar
- China: Zhixin Hao
- Sri Lanka: Poorna Yahampath
- Thailand/Vietnam: Brendan Buckley (Ed Cook to contact)
- Stream flow data from China: Juerg Luterbacher
- Korea: Takeshi Nakatsuka
- Japan: Takeshi Nakatsuka and Junpei Hirano

When compiling all the documentary records, maybe should mention what period they are covering. Is there a particular period of special interest that could be focused on, in the case a full reconstruction is not possible?

Instrumental data collection? Yes, should be aimed for, but no clear consensus on how much effort should go into this. Decide on selection criteria for instrumental records?

Chenxi XU will continue to act as main data manager.

➢ **Chinese Documentary data**

The Chinese documentary T data can be contributed by the end of March (Zhixin Hao). Continuous data: 300 years at annual resolution. 500-1000 years at ca. 10-year resolution. Only annual resolved reconstruction for gridded product.

➢ **P data collection – Next steps**.
1) Selection criteria must be defined (same as 2k Network for T or shorter?)
2) Preliminarily search for records. What is available?
   Collect only metadata first using the Excel template with minimum entries (see attached xls file).
3) Data collection using the full submission templates of the 2k project

➢ **Reconstructions**

Outcome of last years 2k meeting on reconstruction methods (Woods Hole, USA): no silver bullet reconstruction method exists. The Baysian approach is very good, but for spatial reconstructions very time demanding (typically 2-3 weeks of computation for a reconstruction).
But Juerg Luterbacher and Huan Zhang have funds to do a Bayesian multi-proxy reconstruction for Asia and will do it. Timeframe similar as for the 2k project, i.e. done by ca. one year from now.

Potential products:
Planned
- Temperature reconstruction, Tree ring based, Cook et al. 2013.
- Temperature reconstruction, gridded multi-proxy, Shi et al. sumitted
- Hydroclimate reconstruction: Monsoon Asia Drought Atlas v.2, Cook et al. in prep.

New?:
- Temperature reconstruction, 2-3 methods using the new T multi-proxy database?
- Hydroclimate reconstruction: Monsoon precipitation. Gridded or index.
Annually resolved and lower resolution? Gridded on compilation of low and high resolution data.
Decisions needed today.

Temperature Reconstruction

Jianghao Wang has her global T reconstruction almost ready. The Asian regional can either be extracted directly or criteria adapted for the region (global extraction provides better results).

An approach could be to use 2-3 methods using the exact same set of low and high frequency data. 1) Bayesian (Huan Zhang), 2) GraphEM (Jianghao Wang)

and 3) an additional method (Zhixin Hao). Cook et al. 2013 tree ring based T reconstruction used for comparison.

High vs low resolution:
Bayesian method has no problem with high and low res. GraphEM needs overlap with instrumental data (and enough data points during that period), otherwise also no issue with low-res data. → The methods do not require only high resolution data.

Should 3 versions of the reconstructions be made? 1) High resolution, 2) Low resolution and 3) merged high+low resolution?

Data selection:
Jianghao shows plots made every record in the T global database and asks how the expert knowledge could be better incorporated. One type of plots shows the spatial correlation to reanalysis data. In good case, there is a strong local correlation. But other records, not correlated, maybe because they represent a different season. The problem is that such tests are only statistical, with no physical knowledge incorporated.

Response: All choices should be well justifiable. Strong screening is hard for the database, but well justifiable. Maybe the criteria for this screening could be adapted for the regional vs global reconstructions. This problem is not to critical for T, but might become a serious issue for P for which a much denser proxy data coverage is needed.

Precipitation Reconstruction

Benchmark is the Drought Atlas. Therefore a different index than PDSI should be targeterd. Ideally a gridded analysis of monsoon P. Given the high number of Documentary, tree, speleothem, and wetness records available P should be achievable. The reconstruction of other climate parameter will also be considered based on the available data. If issues occur to create a spatial reconstruction, index reconstruction for sub-regions will be targeted.

GraphEM: Jianghao will graduate in August and will not be available for a P reconstruction.
Bayesian: Not clear yet if the method works for P. But Johannes Werner (Arctic2k) will be approached to collaborate on this issue.

P data must be collected by this summer to realistically finish a P reconstruction by mid-2016. The metadata should be collected in the next 1-2 months.

The data will be collected using the same procedure and template as for T. The 2k-NOAA submission template is used because it contains all the needed metadata entries, can easily read by computers, and is already in the right format for the eventual submission to NOAA's public data archive.

➢ Data quality control

Plots, maps and an online Excel table were provided by Nick McKay (2k Network data manager) for quality checking by the Asian2k group. Several entries are still incomplete and metadata need to be checked and gaps filled.

All Asia2k members are requested to check the records and report errors to Chenxi!

The records will further be checked by:

Tree rings: Ed and Dmitriy
Marine records: Philip Munz
Cave deposits: Naveen Ghandi
Boreholes (records not yet inverted): Olga Solomina to contact authors
Ice cores: Chenxi Xu
Lake sediments: Chenxi Xu

➢ Contribution to the 2k global Isotopes compilation effort

The meeting participants agree that the planned compilation of isotopic records is an important project and wants to contribute to this effort.

Kei Yoshimura and Shreyas Managave volunteered to coordinate this effort for the Asian region.

➢ Project Timelines

Quality control of T records: By the end of March (update, mid April)

MADA v2 (Ed):   By June

Precipitation data
Metadata compilation: By mid April (update, end of April)
Data compilation Precipitation: By the end of June
P Reconstruction: By Spring 2016
P Reconstruction paper: By fall 2016 (2k Special issue)

➢ Miscellaneous

- Next meeting of Asia2k

Currently the focus should be on achieving the goals now set. An additional meeting is currently not necessary, but can be organized if needed. Zhixin mentioned that funds could be available for a meeting to be host in China.

- Group leadership

The leadership structure remains unchanged.

- Workshop report for the PAGES Magazine

Takeshi to prepare a report. Juerg, Ed and Lucien to help?