

# Hydroinformatics for Further Comprehensive Study on Environment in South-East Asia

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## Abstract

A comprehensible regional study, named GAME-Tropics (GAME-T) was held focusing on the water and energy cycles in tropical monsoon Asia. Enhanced observation of atmosphere, field measurements of surface fluxes in typical land scapes, data collections of routine observation, and numerical experiments were performed during 1996-2002. This international project made success to establish a data center both in Japan and Thailand, prevailed interesting facts of hydro-climatology in Indo-China Peninsula, and formed a research community in the region. GAME-T2 was planned and started to further investigation considering how hydro-climatic studies can answer to the water resource management in the region. GAME-T Phase1 covered mainly physical side of the hydrological cycles, and the collaboration with more human dimension oriented projects such as START (System for Analysis, Research and Training) will be one of the keys to success the GAME-T2 or following project.

*Keyword: GAME Tropics, Hydroinformatics, Flood Forecasting, Water Resources Management*

## 1. Background

The one of the motivations to establish the Asia Pacific Association of Hydrology and Water Resources should be the needs to attract more attention to the characteristics of hydrological conditions in the region relevant to water resources management. Here, hydrological conditions consist such as geography, climate, social system, and culture.

In this article, the characteristics of the region, particularly in Thailand in the Indochina Peninsula, are introduced from the experience of a research project, named GAME-T. GAME-Tropics (GAME-T) was initiated officially as one of four regional studies under GAME (GEWEX Asian Monsoon Experiment) in 1996. The objective of GAME-T was the quantitative monitoring of vapor flux, precipitation, evapotranspiration, radiative flux, and their seasonal, intra-seasonal, and interannual variation in the south-east Asia. In order to accomplish the objective, various field observations and data collections were planned and implemented.

There were intensive international interactions among researchers, officers, and collaborators within GAME-Tropics, and motivations for the research on understanding the variation of the Asian Monsoon and its social application, such as water resources management, were stimulated. Consequently, observational network on hydrometeorology in tropical South-East Asia was well organized, various scientific achievements were fulfilled, and new findings were prevailed under GAME-Tropics. Publication list appeared in scientific journals can be seen at

<http://hydro.iis.u-tokyo.ac.jp/GAME-T/publication.html> and the data was processed or under processing partly, and all the data will be available at:

<http://hydro.iis.u-tokyo.ac.jp/GAME-T/GAIN-T> where GAIN stands for GAME Archive Information Network, and GAIN-T is one of the distributed archive center of GAIN responsible for GAME-T related datasets. Detailed description on the individual dataset should be

found either in associated document with the data on the Web or in scientific papers published by the principle investigators of each observation.

## 2. Concept of the successing project

As introduced in other presentations in the conference, there were many unique topics and issues to be tackled with in the Asian Pacific region for both hydrological research and water resources management. International collaboration and information sharing and exchange should be promoted to deal with these topics and issues.

On the other hand, the most relevant fruit from GAME/GAME-T could be the international research community organized under the project and firmly formed through the collaborative field experiments, joint data processing, and the exchange of various ideas at frequent meetings, workshops, and symposia.

A lot of efforts will be required to build up such a smooth, constructive, and significant scientific community again.

Therefore, GAME-T follow on, namely GAME-T2, was planned and it is now undergoing. Scientific objectives of GAME-T2 are similar to the original project:

(I) Promote hydrometeorological science in Tropical South-East Asia, and

(II) Seek social application of the latest achievements of academic research.

For the first objective (I),

1. numerical modelings,
  2. satellite data assimilations aiming at spatial scaling from a point to a certain area, and
  3. data sharing and communication
- should be promoted.

The success of GAME-Tropics stimulates the motivation to continue the project, and recommendation for further study under GAME-Tropics or successional project was discussed and adopted in the 2002 workshop on GAME-T and Hydrometeorological Studies in Thailand and Southeast Asia, 29-31 October 2002, ChiangRai, Thailand, and all the participants recognized its direct and indirect contributions for solving the

current and future water related problems. One possible target proposed was the investigation of the “Scientific Basis for a Hydro-meteorological Warning System” in short, medium, and long ranges for flood and drought management with the basic understanding of the Asian Monsoon System and the latest technology of monitoring and modeling.

### 3. Recommendations

At the 2002 Workshop on GAME-T and Hydrometeorological Studies in Thailand and Southeast Asia, 29-31 October 2002, held in ChiangRai, Thailand, the recommendation for the future project on the hydrometeorological studies in SouthEast Asia was discussed, and approved by all the participants. The whole recommendation is quoted below.

Recognizing water as one of the keys to develop sustainability in societies both in developed and developing countries, its monitoring, modeling, and predicting the variation of its quantity and quality are critical and should be promoted for better implementation of integrated water resource management. With regard to that point of view, the activities and research achievements of GAME-T (GEWEX Asian Monsoon Experiment in Tropics) were reviewed and discussed during the 2002 workshop on GAME-T and Hydrometeorological Studies in Thailand and Southeast Asia, 29-31 October 2002, ChiangRai, Thailand, and all the participants recognized its direct and indirect contributions for solving the current and future water related problems. In order to promote such critical research activities, all the participants would like to recommend that relevant agencies to hydrometeorology and universities in participating countries should report to the head of their respective agencies the implementation of the GAME-T Phase II during the period of 2002-2005 along the lines described as follows:

1. The formulation of a new research group, consisting of young scholars in each country, is required with strong leadership under the supervision of the GAME-T advisory board in each country. Both the new group and the advisory board should hold the perspective of international collaboration among Thailand, Japan, and other participating countries in South East Asia.

2. Further exchange and the sharing of data and information should be promoted. One of these activities would be a publication of a textbook on hydro-climatology in South East Asia based on the fruits from GAME-T Phase I. Strengthening the utilization of the existing mailing list over the Internet is also encouraged. The GAME-T Data base servers both in NRCT and IIS/UT should be used actively with continuous input from field observation, data collection, etc. The data should also include human dimension related information. The GAME-T workshop in Thailand, which is held once a year, is giving opportunities for the exchange and sharing of data and experiences in hydrometeorology. Therefore the continuation of the workshop is recommended.

3. Capacity building in scientific research is crucial. Researchers and young scientists in Thailand,

Japan, and participating countries should have opportunities, such as being an exchange scholar or a visiting scientist, participating in the conferences, making presentations in workshops, and joining technical visits, etc.

4. A series of appropriate research topics should be formulated for narrowing down the scope of research works. One possible target could be the investigation of the “Scientific Basis for a Hydro-meteorological Warning System” in short, medium, and long ranges for flood and drought management with the basic understanding of the Asian Monsoon System and the latest technology of monitoring and modeling. Research focusing on human dimension aspects should also be well regarded when implementing the project.

### 4. Summary

Under the development stage of the 10-year implementation plan for establishing the Global Earth Observation System of Systems (GEOSS), GAME-Tropics will be a good core to support the studies on global environmental issues such as Disasters, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture and Desertification, and Biodiversity in South-East Asia through development of the integrated information system on hydroinformatics. Current GAME-T covers mainly physical side of the hydrological cycles, and the collaboration with more human dimension oriented projects such as START (System for Analysis, Research and Training) will be one of the keys to success the GAME-T or following project.