KIGUCHI LAB.

[Frontier technology of global water cycle monitoring and prediction]

Department of Human and Social Systems

Monsoon Variation Climatology

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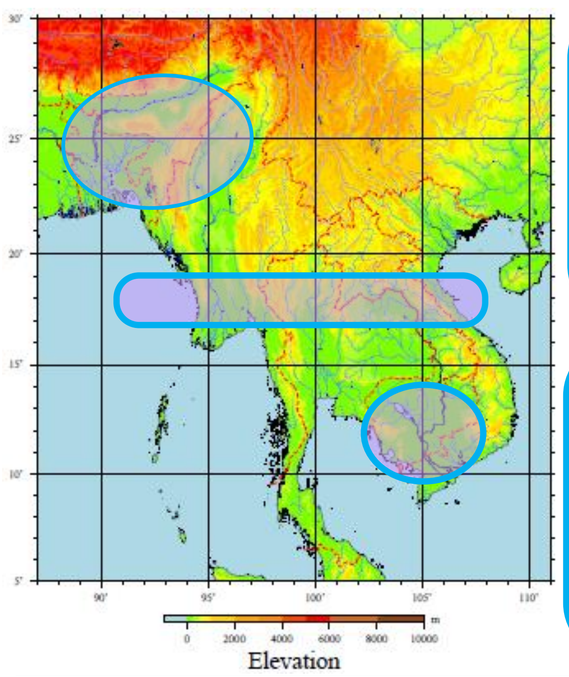
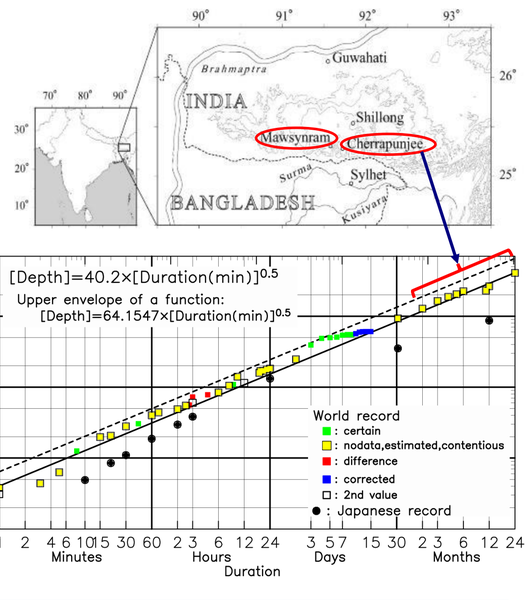
We research hydrometeorology while paying attention to monsoon circulation which has important role for global water circulation. Especially, Asian monsoon provides abundant rainfall in Asian countries, so that this has big role of not only a part of global water circulation but also human activities such as agriculture, drinking water, and so on. Seasonal and annual variabilities affect to human society. We proceed the research of monsoon variation from the viewpoint of climatology.

To understand monsoon circulation, we analyze using observation data. However, observation density is not enough in some countries. To cover that, some researches employs numerical simulation results. But when we evaluate that, observation data is still necessary. So, it is necessary to select area where we need and to conduct observation by ourselves. To understand monsoon circulation, we conduct observation network in Thailand, Laos, Cambodia, Bangladesh, and India.



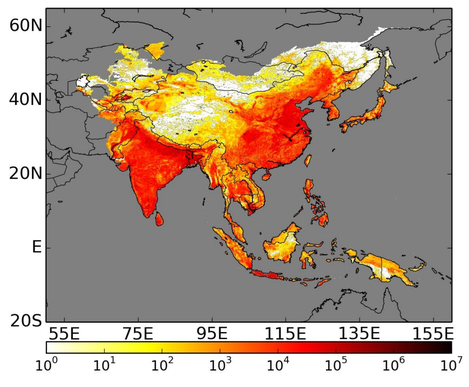
Cambodia is located downstream of Mekong river and flood-prone zone. There is interesting lake, named Tonle Sap Lake, in central area. In rainy season, this lake expands because of backflow from Mekong River, while water in dry season flow into Mekong River. Due to historical background, rainfall and other measurements in this region are limited. We conduct observation using high time resolution rain gauges. In cooperation with operational agencies, we construct database of hydrometeorology and flood at same time.

Brahmaptra river basin includes world highest rainfall area, where there are some stations more than 10,000mm / year, so that floods are frequency occur. We conduct high time resolution rain gauges network in Assam State, Meghalaya State, in India and Sylhet State in Bangladesh. In cooperation with some academic institutes and operational agencies in India and Bangladesh, we research and construct database.

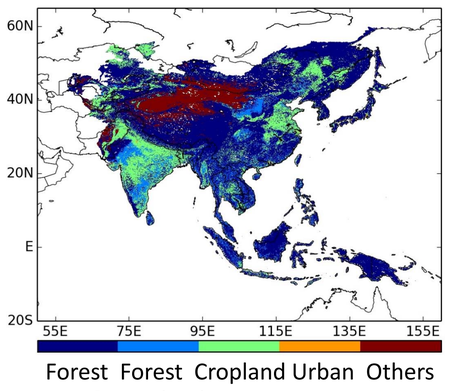


In Indochina Peninsula, there are mountain chains north and south, and there is abundant rainfall due to dominance of southwesterly in monsoon season. So that rainfall in monsoon is very important for human activities. Moreover, due to orographic effects for rainfall pattern, there are differences of rainfall amount west and east. To detect this phenomena in high time resolution, we conduct rainfall observation network in Myanmar, Thailand, Laos, and Vietnam.
For flush flood in Vietnam, we conduct rainfall network while paying attention to a valley near Da Nang city in central of Vietnam.
In cooperation with academic institutes, operational agencies, and international institute (Mekong River Commission), we employs hydrometeorological data and analyze.

There is very important issues about effect on monsoon circulation by global warming, but there is little researches. We analyze water scarcity using change of rainfall and population pattern, and water demand by human activities in the future.



Population distribution in 2000 (ALPS, RITE)



Land cover distribution in 2000 (MODIS)

Table: Median & standard deviation of damage cost in major Asian countries in current (1970-2000) and the end of 21st century (2070-2100). End of 21C (2000) & (2100) is results using socio-economic data in 2000 and 2100, respectively. Unit is million US$.

Countries	Median			Standard deviation		
	Current	End of 21C (2000)	End of 21C (2100)	Current	End of 21C (2000)	End of 21C (2100)
Bangladesh	10,291	12,441	665,567	3,095	3,205	171,437
Cambodia	709	1,155	87,236	183	206	15,597
China	152,063	165,232	4,983,447	7,335	12,125	365,766
India	43,700	50,270	2,690,416	4,096	3,806	203,830
Indonesia	7,651	8,065	183,064	691	880	19,985
Japan	162,468	178,797	267,186	24,433	21,831	32,619
Laos	350	468	38,644	76	96	7,919
Myanmar	858	1,051	57,303	275	238	13,007
Philippine	1,192	819	29,665	628	527	19,099
Thailand	8,012	12,892	149,723	1,939	3,201	37,170
Vietnam	5,642	6,749	315,249	845	872	40,731