

## WPI centers on March 11, 2011 and aftermath

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The magnitude (M) 9.0 earthquake struck the east Japan on the afternoon (14:46) of March 11, 2011. It was the 4 th largest earthquake of the world since 1900. The epicenter was located at 130 km from the coast of Sendai and 24 km in depth under the Pacific Ocean, causing the devastating tsunami. Thirty min after the quake, 20-meter wall of sea water had swept across towns of the coast, washed away houses, cars, boats and even airplanes and killed nearly 25,000 people living in these areas. Japan has been well prepared for earthquake and tsunami by the world densest monitoring network, the biggest tsunami barriers particularly in these areas and warning systems by catching primary (P) wave of quake. However, M 9.0 quake and 20 m tsunami were far beyond our preparations and imagination.

The quake shook academic facilities in Sendai and Tsukuba. Although nobodies were killed or injured and buildings were not so badly damaged, WPI-AIMR and MANA, which are renowned for material science, had serious damages of fine equipments including STM (Scanning tunneling microscope) by M9 earthquake and the following M7 aftershocks. Most of them were placed on earthquake-proof foundations, but they were vigorously shaken. Damaged equipments are now being repaired by replacing parts or by realignment of optical axis etc (Figure). It will take further months to be recovered completely to the level before March 11.]

Costs to restore them are estimated approximately 242 million yen (US\$ 2.9 million) for AIMR and 200 million yen (US\$ 2.4 million) for MANA, which will be compensated by the supplemental budget of the government. However, most serious loss for researchers is loss of time. We sincerely hope that they will catch up rapidly and return to the frontier of research shortly.

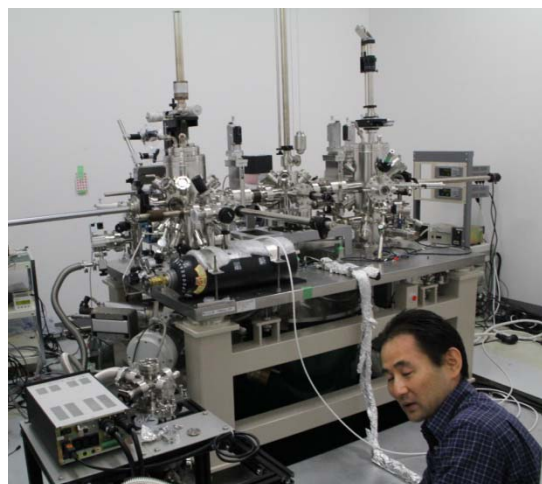


Figure. STM (Scanning tunneling microscope) damaged by the earthquake. Dr. Hitosugi, AIMR

IPMU, which locates 25 km south of MANA, was not damaged. Among IPMU-related research facilities, Kamioka was not suffered from the earthquake but KEK and newly opened J-Park were seriously

damaged. Professor S.T. Petcov, a visiting scientist of IPMU from Italy, will report his personal experience of March 11 and aftermath in "IPMU News".

Another WPI centers, iCeMS, IFRcC, I<sup>2</sup>CNER, which locate far away in south and west Japan, has no damage at all, though they felt unusual shake in Kyoto and Osaka.

In addition of these earthquake and tsunami, we faced the third disaster; the nuclear power plants in Fukushima became out of control totally and nuclear fuel was melted down. However, environmental radioactivities have been at the level of normal background or only marginally high (IPMU), as shown in Table 1.

Table 1. Environmental radioactivities in 6 WPI centers.

WPI	City	Distance from Fukushima nuclear plants	Environmental dose
AIMR	Sendai	94 km	0.07 $\mu$ Sv/h
MANA	Tsukuba	170	0.08
IPMU	Kashiwa	196	0.25
iCeMS	Kyoto	540	0.04
IFReC	Osaka	570	0.04
I <sup>2</sup> CNER	Fukuoka	1065	0.04
-	Tokyo	230	0.06

Data (as of May 20, 2011) are taken from URL of MEXT and Univ. of Tokyo (for IPMU ).

Radioactivity before March 11 is 0.03-0.08  $\mu$  Sv/h.

National Institute for Radiological Sciences estimated cancer risk of habitants in Tokyo on the assumption that environmental radioactivity is 0.5  $\mu$  Sv/h and food stuffs contain upper limits of radioactivity (300 Bq / kg) for 90 days. Under these conditions, life-time cancer risk at all sites will increase only marginally by 0.0265%.

As seen in the report of Professor Petcov, there was no panic and everybody was calm even after the triple disasters. However, continuing aftershocks, uncertainty of nuclear plants and lack of information triggered exodus of foreigners from Japan. In particular, some European governments e.g., French, Italian, German and Swiss, strongly advised their citizens to leave Japan and prepared free charter flights. Foreign media also exaggerate the crisis and report that the whole nation is likely contaminated with radioactive materials and foods are not available. Such an overreaction of the governments and media caused unrest among WPI researchers from abroad.

As a result, 29-52% of foreign researchers left Japan in AIMR, MANA and IPMU shortly after the disaster, but most of them now returned and continue their research activity as seen in Table 2. Those who still remain in their home promised to return to WPI centers shortly. However, some newly appointed postdocs cancelled his/her contract.

Internationalization is one of goals under the WPI program. We will further support the international faculties and students by providing comfortable environments and full information for research and daily life

Table 2. Evacuation of foreign researchers from WPI research centers.

WPI	Total foreign researchers before March 11	Evacuated researchers on March 31	Evacuated researchers on May 30
AIMR	44	23 (52.3%)	5 (11.4%)
MANA	113	33 (29.2%)	13 (11.5%)
IPMU	41	12 (29.3%)	6 (14.6%)
iCeMS	30	0 (0%)	0 (0%)
IFReC	49	1 (2.0%)	0 (0%)
I <sup>2</sup> CNER	10	0 (0%)	0 (0%)

Taking this opportunity, we would like to express our sincere sympathy and condolence to victims of these triple disasters.

We much appreciate for the support and sympathy given by our colleagues, friends and science communities of the world, which greatly encourage us. We are convinced that we will recover quickly and return to the frontier of science.