

Experiencing the 2011 March 11 Earthquake and its Aftermath at IPMU

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When the biggest earthquake in modern Japanese history struck on March 11 at 2:46 PM, I was in my office on the 3rd floor of the IPMU building in the Kashiwa campus. I did not have much earthquake experience and was wondering what to do since my office and the whole building were shaking and swinging in a way I have not seen a building doing that before, when one of the IPMU secretaries, Yuuko-san, told me I should leave the building. I collected my things, put on my coat, descended the stairs and got out of the building which continued to tremble. Many IPMU scientists and members of the administration were already outside the building in the open space in front of it, some were still leaving the building. People were getting out of the adjacent buildings as well. There was no panic, everybody was calm. Soon the space in front of the buildings of the Kashiwa campus was full with people. Many of my colleagues used their mobile phones to connect to the Internet and get the latest information about the earthquake. We learned that the epicenter is in the Pacific Ocean off the north-east coast of Japan and that it was of magnitude 8.9-9.0 on the Richter scale, or 6+ on the Japan Meteorological Agency (JMA) seismic

intensity scale. In the Tokyo area it was of magnitude 5- to 5+ on the JMA scale. Soon a tsunami warning was issued for the north-east coastal area of Japan. I met in the crowd two members of the Super-Kamiokande and the T2K neutrino experiments, Nakahata-san and Shiozawa-san, who came out of the ICRR building, and had a very interesting discussion about the latest results from Super-Kamiokande and the first T2K event which had all the characteristics of being due to $\nu_{\mu} \rightarrow \nu_e$ oscillations. The latter exciting result was supposed to be discussed that afternoon at a seminar at KEK and on March 18 in a talk scheduled to take place at ICRR (both presentations were cancelled). The ground and the buildings continued to shake and tremble from time to time due to the aftershocks, some of which were rather strong. The IPMU secretaries managed to get the coffee and the cakes from the IPMU building, which were prepared for the traditional 3 PM coffee and tea break, and we were enjoying hot coffee in the cold weather outside the building. The news about the effects of the earthquake continued to flow and during the first hour there were no reports of big damages. The tsunami had not reached yet the coast. It began to rain and we were



invited to take shelter in the building of one of the restaurants where we usually had lunch. At around 5:30 PM it was announced that we can go back to our offices at the IPMU building - the building was inspected and no damage was found. Later we learned that none of the Kashiwa campus buildings had any damage (except some non-serious ones). Actually, the same was true for the enormous number of buildings in Tokyo, the only exception being few buildings in the Tokyo Disney Land park area, which were built on a land recovered from the sea.

The next problem for those of us who lived in Tokyo was how to get to Tokyo. The Tsukuba Express and the JR trains as well as most of the metro lines were not running since it was necessary to check the tracks for

damages. In the case of the Tsukuba Express these checks took two days to complete. The IPMU secretaries managed to reserve 3 rooms in a hotel not far from Kashiwa for Ooguri-san,^{*1} Maeda-san^{*2} and his wife and child who happened to be in Kashiwa by chance, and myself. This was very nontrivial given the circumstances, some members of the IPMU administration could not get home and spent the night in the IPMU building. We were spared this inconvenience, the room I got in the hotel was very comfortable. The next day (which was Saturday) we drove to Tokyo in a taxi. It took us about 3 hours to cover the distance of 30 km to Tokyo since the highways were closed for inspection and the traffic was quite intensive on the other roads leading to Tokyo.

The five-storey building of the Elite-Inn Yushima Residence near Ueno, Tokyo, where I lived, was intact. The Residence was located in a charming quarter next to the Yushima Tenjin Temple, at a walking distance from the Hongo campus of the University of Tokyo. In the studio which I rented, there was no damage, only the night lamp fell on its side. The scale of devastation and loss of life, caused by the tsunami, began to unfold in the news reported on the TV. On that day the first reports about the problems at the Fukushima Daiichi nuclear plant appeared. I was following the news on the TV channels of CNN, BBC and later - on the NHK service in English. On the Internet I was reading the reports in the Italian and other European media.

The Internet connection worked without any interruptions after

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the earthquake. On March 12 my Ph.D. student at SISSA, A. Meroni, submitted to the arXiv our (with three more co-authors) article on multiple mechanisms of $\beta\beta 0\nu$ -decay, on which I was working since my arrival at IPMU.

The week after the earthquake (March 14 - 18) I stayed in Tokyo. Due to the problems with the Fukushima nuclear plant, there were electricity blackouts at Kashiwa (there were none in the area of Tokyo where I lived) and the Tsukuba Express line was operating with largely reduced number of trains and with a schedule that made the trip to the Kashiwa campus quite problematic. We were receiving daily information about the planned blackouts and the train schedules from the IPMU secretaries, Yuuko-san and Midori-san, with whom I was in contact via the Internet. Hitoshi Murayama, the IPMU director, asked the members of IPMU (including the visitors) to report any problems caused by the earthquake. The “census” showed that, fortunately, all IPMU members were fine.

My life during that week was very simple: I would have breakfast

in my studio, then work until lunch time, have lunch in one of the many restaurants in the Ueno area (my preferred places to eat were a ramen, udon, sushi/sashimi and Korean restaurants), have a walk in the Ueno park after the lunch, do more work in my studio in the afternoon and the evening, and go out to have dinner and a brief walk after that; sometimes I had just a bento for dinner. I also spoke every day by phone with my family. The situation at the Fukushima Daiichi nuclear plant was becoming alarming and since March 14 our colleagues-scientists from the University of Tokyo and KEK began providing data on the Internet about the levels of radiation at the Hongo and Kashiwa campuses and in the Tsukuba area where KEK is located. I was checking these data few times a day. Late in the evening I was watching the news on the CNN and BBC programs as well as reading the news reports in the Italian media; as an entertainment I was watching from time to time some of the games of the Italian soccer team Inter-Milano, which were shown on one of the Japanese sports channels late in the evening. Without the

usual distractions I managed to do a lot of work that week, essentially completing a study with two junior colleagues on the low energy signatures of the TeV scale type I see-saw model of neutrino mass generation. The results of this study were collected in an article which was sent to the arXiv at the end of March.

In the first week after the earthquake some of standard food items one could buy in the convenience stores in Tokyo - different types of onigiri and bento, yogurt and cakes, were not available - there were empty shelves at the places where one could usually find them. However, one could find most of these food products (at a somewhat higher price) and much more, including the Italian cheese Gorgonzola, Mozzarella, etc. in the food section of the Matsuzakaya department store in Ueno. The restaurants in the area where I lived were working also as usual. Therefore I was a bit surprised at the reports in the European and American news media that there were food shortages in Tokyo. This was indeed true only for one item: the Bulgarian style yogurt was missing and actually did not appear on the shelves of the convenience stores even one month after the earthquake.

In the period March 12 - March 15 there were hydrogen explosions at the Fukushima nuclear plant with a release of a certain amount of radioactive material in the environment. The Japanese government ordered the evacuation of the residents living within the 20 km radius zone of the plant. The continued aftershocks and the possibility of much more massive radioactive contamination which could reach Tokyo (Tokyo is located at 240 km from the Fukushima plant) and the south-western part of Japan,

triggered the exodus of foreigners from Tokyo and Japan. The French, German and Swiss governments advised their citizens to leave Japan. Charter planes were sent to collect the citizens of these countries who were willing to leave, all the expenses (including the air tickets of the passengers) being covered by the respective governments. Similar advises were issued also by the Italian, British and American governments. The German national airline Lufthansa stopped flying to Tokyo; its planes were flying to/from Nagoya and Osaka only. On March 20 the wind changed direction and brought certain amount of radioactive iodine-131 (half-life of 8 days) and cesium-137 (half-life of about 30 years), which were being emitted by the Fukushima nuclear plant, to the Tokyo area. This led to the increase of the radiation levels by a factor of 4 at the Hongo campus and by a factor of 5 at the Kashiwa campus. The subsequent rain made the iodine-131 appear in the water supply system of Tokyo in quantities corresponding to a radioactivity of 200 Becquerel (Bq, 1 Bq = 1 decay/second) per liter. This level was considered dangerous only for children under the age of one year. The Tokyo municipality authorities distributed about 240 000 bottles (of 0.55 liter each) of mineral water to the families with small children. Some of these families preferred to leave Tokyo and spend some time further away in the south of Japan - in the Osaka area. The European and American media were writing about an exodus from Tokyo of its inhabitants. I did not notice any significant decrease of the density of population in the Ueno area. The indicated reports were contributing to the creation of a feeling of an

eminent unavoidable catastrophe.

The aftershocks were not worrying me after the buildings in Tokyo and Kashiwa survived without damages the March 11 earthquake. When the iodine-131 appeared in the tap water in Tokyo, I used for several days only mineral water for drinking and the minor cooking I was doing. Moreover, I knew that the human body is radioactive at the level of 50 Bq per liter due to the presence of potassium-40 (half-life of about 1 billion years). A medium size person had a natural radioactivity of about 3000 Bq. I was following the daily (hourly and the real time) data about the radiation levels provided by colleagues-scientists. I read also a number of review articles and reports about the natural radiation levels, the radiation doses one gets from various X-ray machines, scanners, and radiation therapy of cancer, used in medicine, as well as about the effects of the radioactivity released at Chernobyl. I learned that an X-ray of the chest corresponds to an average of 250 hours of natural radiation exposure in the area of the Hongo campus in Tokyo. It was clear from these reports that the radioactive fallout at Fukushima was much less than that at Chernobyl. The increased radiation levels at the Hongo and Kashiwa campuses were as the natural radiation background in some populated areas around the world. A British person, for instance, is exposed on average to about 2.5-3.0 times more radiation than an inhabitant of Tokyo due to the natural background. Moreover, as the data were showing, after the March 20-21 increase, the radiation levels at the two campuses of the University of Tokyo and in the tap water in Tokyo began to decrease, as was expected in the absence of a

new contamination.

My family was anxious about me staying in Japan. Many friends and colleagues from Europe, who were reading the reports in the European media, expressed strong concern as well. My decision to stay was based on the analysis of the facts mentioned above and only on one “bet,” namely, that the “big earthquake” which is predicted by some geophysicists to hit Tokyo some (unknown) time in the future, will not occur so soon after the March 11 one. I hope it will not occur in any foreseeable future.

On March 25 I met Hitoshi Murayama who was spending that week at IPMU (Hitoshi is sharing his time between IPMU and UC Berkeley). He told me that the experiments at Kamioka (Super-Kamiokande, KamLAND, XMASS, etc.) did not suffer any damage from the earthquake, but that the KEK and J-PARC accelerators had some damage. I learned also that many foreign scientists canceled or postponed their visits to IPMU.

The situation in the Tokyo area was gradually returning to normal during the second and third weeks after the March 11 earthquake. In the convenience stores all standard food items became available. The Tsukuba Express trains were running first at 60% rate (without the rapid train service) and later at the usual pre-earthquake schedule. The blackouts at the Kashiwa campus were canceled. The colleagues were returning to IPMU and the scientific life was gradually resuming its standard rhythm. The radiation levels measured at the Hongo and Kashiwa campuses as well as at KEK (in Tsukuba) were decreasing. Starting from the beginning of April they were in most of the Tokyo area at the levels before the March 11 earthquake. The

aftershocks were continuing. There were several on April 8 (Friday), but the first which happened around 8:20 AM was both relatively strong and long and made me wonder whether the Residence building I was in will survive it. However, as I was about to reach the stairs to go out of the building, it was over; the building did not have any damage. I experienced another one in the metro: the train of the Chiyoda line I was traveling on was at one of the stations when the tremor started and the cars began to swing slowly. Nobody panicked, people began connecting to the Internet with their cell phones to get more information. After the tremor ended we waited for about several minutes before the train started moving again.

The last part which follows contains very personal and subjective comments and observations, some of which might be due to the lack of sufficient information and thus might not be correct. My impression about the efforts by the TEPCO^{*3} company to gain control over the damaged Fukushima Daiichi nuclear plant was that the problems the TEPCO was facing were too many and too complex for the company. The company was doing what it could to avoid the radioactive fallout, but was overwhelmed by the scale of these problems. I expected that the Government will gather a team of experts, or will invite foreign experts, to help TEPCO much sooner than it did it. I am not sure the other companies which run nuclear power plants in Japan offered help (I may be wrong on this point). What was obviously lacking was some kind of Nuclear Emergency Unit - a group

*3 Tokyo Electric Power Company

of nuclear engineers, physicists and technicians, trained to deal with possible complex problems at nuclear power plants (I am not sure such units exist in the U.S., France or the other countries which have nuclear power plants). It was also my impression that the actions of the Nuclear and Industrial Safety Agency of Japan were not very helpful and useful - they were just adding “pressure” on the already much stressed TEPCO staff at Fukushima. I was surprised to learn that the electricity supply grid in the western part of Japan is “incompatible” with the grid in the eastern Japan, so that it is impossible to transfer electricity from the western grid to the eastern grid and vice versa in the cases of emergency like the one after the Fukushima plant stopped supplying electricity to the eastern grid. This caused the necessity to save electricity and led to the blackouts and other measures which had a negative impact on the economy in eastern Japan. Making the two grids compatible and creating one unified grid in Japan will have considerable economic and practical advantages.

Finally, I would like to use this opportunity to express my deep condolences and sincere sympathy to all my Japanese colleagues and the members of the IPMU administration for the devastation and the loss of life caused by the March 11 earthquake and the subsequent aftershocks and the tsunamis. I would like also to thank the members of the IPMU administration who did everything possible to ensure normal working and living conditions for the IPMU visitors during the first dramatic weeks for Japan after the March 11 earthquake.

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