

Activity Report of the NAOJ Visiting Scholar Program

Host Project/Division: Division of Science

Name of Host Scientist: Takashi Moriya

Name of Visiting Scholar: Paolo Mazzali

Title: Visiting Professor
(Choose the appropriate one)

Period: from 19/04/18 to 19/05/21

I . Report from the visiting scholar

[1] Achievement during the period of stay (in comparison with the initial plan) *Please fill out the attachment if you have made presentations at academic conferences or if your research has been published in academic journals

(Collaborative Research)

I spent little over one month at NAOJ (17 April – 22 May 2019).

The main purpose of the visit was to collaborate with Dr. Takashi Moriya on theoretical work on Supernovae.

Funds were also awarded for some travel within Japan. I am grateful for this.

Work with Dr Moriya was very successful.

We completed the work concerning a novel interpretation of the enigmatic, luminous and long-lived transient iPTF14hls. We suggest that this was not a supernova, but rather an episode of enhanced mass loss, caught in the act and therefore appearing more like a continuous outflow than an explosion.

We were able to compute both the instantaneous mass loss rate and the total amount of mass lost (some 10 solar masses in about one year). We show that the light curve of the event is very similar to the historical Great Eruption of eta Carinae in the 1880's. We are now working on a draft to be submitted to Nature.

We also worked on iPTF11rka a luminous type Ic SN which shared characteristics of Superluminous SNe and Pair Instability candidates. We had obtained late-time spectroscopy at ESO-VLT. We made significant progress on determining the properties of this event, which is intermediate between SNe Ic and SLSNe, and therefore represents a very important link.

Taking advantage of the presence of Dr. Famiano, also a visitor at NAOJ and a guest of Prof. T. Kajino, we also made progress on aspects of atomic and nuclear physics related to binary neutron star mergers.

We travelled twice away from Tokyo.

First we visited Fukuoka Univ., where we discussed with Prof. Kei Kotake and his group and planned work on jets in Gamma-ray Bursts.

We then travelled to Sendai to visit Prof. Masaomi Tanaka at Tohoku Univ. I have a long-standing collaboration with Masaomi, whom I advised when he was a PhD student. We discussed many topics, but in particular the implementation of his newly computed atomic models of r-process elements in my radiation transport code in order to obtain a more realistic description of the spectra of kilonovae, the products of binary NS mergers. This will hopefully develop into a major project.

The visit was very fruitful. It is a pity I could not stay longer, but teaching duties called me back to England.

If I may make a suggestion, it may be good to foresee two visits on these positions, as it is much easier to be absent twice for one month than once for two!

We greatly enjoyed the accommodation and the opportunity to spend time at NAOJ, and look forward to visiting again very soon.

(Education)
(Others)
[2]Any comments on this program
II . Report from the host scientist
[3]Any comments on this program