Activity Report of the NAOJ Visiting Scholar Program

Host Project/Division: Division of Science

Name of Host Scientist: Takashi Moriya

Name of Visiting Scholar: Elena Pian

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 visited Dr. Takashi Moriya in the period 17 April – 22 May 2019 in a non-continuous way, as I visited for a few days (24-27 April) also Prof. Kotake and his group at Fukuoka University and Prof. Tanaka and his group at Tohoku University (11-15 May), thanks to an allowance included in this NAOJ visitorship grant.

With Dr. Moriya and visitor Prof. Mazzali we have finalized work on the hydrogen-poor core-collapse supernova PTF11rka. We have analyzed the light curve and 6 spectra (including one at very late epoch (400 restframe days after explosion) with radiative transport models and have concluded that, although the shape of light curve and character of spectra are very similar to those of super-luminous supernovae, particularly of the prototype of pair-instability supernova candidate SN2007bi, the explosion energy and amount of radioactive 56Nickel synthesized are much lower, suggesting that: 1) there is a continuum of properties between hydrogen-poor classical core-collapse supernovae and super-luminous supernovae, so that the latter may be a scaled-up version of the former, not necessarily manifestations of a different explosion or powering mechanism, 2) the case for pair-instability supernova of SN2007bi is further weakened, as its less luminous-energetic counterpart PTF11rka clearly has a core-collapse origin.

I have participate to the work on iPTF14hls with analysis of the spectra and the bolometric light curve, and in deriving the time evolution of the mass-loss parameter.

In addition, I have discussed with Prof. Kajino and his group and visitor Prof. Famiano of r-process nucleosynthesis and proceeded in a project of identification of atomic species and synthesis of kilonova spectra, that was started with Profs. Tanaka and Mazzali 2 years ago. This was also the subject of collaboration with Prof. Tanaka in Sendai.

During the visit in Fukuoka I have given a seminar on my research on kilonova and I have discussed with Prof. Kotake the formation of jets in supernova explosions and the modelling of these in 3D.

I found this visit extremely pleasant and fruitful, as the NAOJ institute in Mitaka offers a quiet and welcoming environment that is conducive to focussing on problems and research. It would be probably worth considering to allow visitors to split the visitorships in two periods of 1 month each, as it is much easier to visit twice for a month each time rather than for an interrupted period of 2 months.

(Education)

(Others)

[2]Any comments on this program

Ⅱ. Report from the host scientist

[3]Any comments on this program