Dear Sir/Madam.

I received my PhD in Astronomy in July 2015 and have since then continued my work on core-collapse (CC) supernovae (SNe) as a research assistant at Stockholm University. My work mainly concerns the connection between SNe and their progenitor stars, and spans from the observational to the theoretical, focusing on Type IIb SNe and SN 2011dh in particular (Papers I-VI). During the last year I have worked with a new advanced radiative-transfer code (JEKYLL) for realistic simulations of spectra and lightcurves for SNe, which could be of great use in the project.

JEKYLL is an powerful tool and has a wide variety of applications. Combined with the hydrodynamical code HYDE (Paper VI) it can be used to model the entire observed evolution of a SN. The code is based on a method developed in a series of papers by Leon Lucy, and solves for statistical equilibrium taking into account all relevant processes, including heating, ionization and excitation by non-thermal electrons. As an example, JEKYLL & HYDE could model the observed spectral and broad-band evolution of the much debated super-luminous SNe in unprecedented detail, which would help to discriminate between the different physical origins proposed.

Modern automated SN surveys like NUTS/ASAS-SN are currently driving a revolution in the amount and quality of SN observations. Thanks also to the ever increasing computational speed this opens possibilities to study large samples of SNe using more advanced techniques than has been done before. In Paper VI I describe and apply a method directly aimed for large samples. The study is based on a grid of SN models constructed with HYDE, and suggests that most Type IIb SNe originate from binary systems. It would be interesting to investigate if this conclusion holds also for the similar Type Ib and Ic SNe, preferably based on an improved grid of models constructed with JEKYLL & HYDE.

I am well acquainted with the Nordic Optical Telescope (NOT) upon which the NUTS project is based, through both on-site and remote observations. In particular, I was running the Stockholm TOO program between 2009 and 2012, for which I also developed tools for automation of the observations. In addition, I have developed tools for atomized reduction and calibration of data from NOT and other facilities, working along similar lines as those used in the NUTS project. Through the work with SN 2011dh I also have the experience to plan and run observational campaigns, needed once a newly discovered SN has been selected for further study.

I think I can offer a quite unique combination of expertise in both observational and theoretical astrophysics, bringing also the tools needed to model the data obtained through the NUTS project. Due to my years in Stockholm I am well acquainted with the members of the SN group, and have worked together with most of therm. The group is one of the strongest in the world, both in theory and observations, and given the high-quality data provided by modern automated surveys like NUTS/ASAS-SN, it is an ideal environment for ground-breaking advancements in our understanding of SNe during the next few years.

Best Regards

Mattias Ergon