# Star Formation in Dwarf Galaxy Evolution: The Impact of numerical Recipes

Gerhard Hensler[1]; Matthias Kuehtreiber[1]; Lei Liu[3]; Rainer Spurzem[2,3]; Peter Berczik[2,3]
*[1]University of Vienna, Department of Astrophysics, Vienna, Austria; [2]Kavli Institute for Astronomy and Astrophysics, Peking University, Beijing, China; [3]National Astronomical Observatories of China, Chinese Academy of Sciences, Beijing, China*

The implementation of star formation (SF) in numerical simulations on galaxy scales and cosmological structures is still a matter of debate and multiple indispensable experiments because of the sub-grid physics of SF and stellar feedback. A large variety of different methods have been developed and applied over the last decades. Nevertheless, it becomes clear that no universal but scale-dependent parameterizations must be implied but need careful tests in which way parameter sets affect the models.
In order to examine this issue further, we perform N-body/SPH simulations of isolated dwarf galaxies (DGs) for different SF recipes, one with the commonly used SF threshold prescription and one derived analytically under the assumption of SF self-regulation. Using the publicly available SPH code Gadget-2 with self-implemented sub-resolution physics, we discuss differences between the SF recipes but also by variations of further free parameters on SF rates, gas dynamics, and galactic chemical evolution. Moreover, in contrast to the generally applied single-phase gas description we develop an advanced multi-phase chemo-dynamical particle code and compare the models of both treatments.
The main conclusions are: Arbitrarily implied parameters, like e.g. the cooling shut-off time, show strong effects on both different SF recipes; the systems react very sensitively on the choice of the gravitational softening length, which also affects the SF; if the supernova efficiency is chosen too high, a DG can be easily disrupted. Finally, we demonstrate that the energetical and chemical evolution of DGs are much properly reproduced by a multi-phase gas treatment.