

FM7
Radial Metallicity Gradients in Star Forming Galaxies

FM 7: Radial metallicity gradients in star forming galaxies

Laura Magrini¹, Letizia Stanghellini² and Katia Cunha^{3,4}

¹INAF-Osservatorio Astrofisico di Arcetri- Firenze, Italy
email: laura.magrini@inaf.it

²National Optical Astronomy Observatory, Tucson, USA
email: letizia@noao.edu

³University of Arizona, Tucson, USA

⁴Observatorio Nacional, So Cristvo, Rio de Janeiro, Brazil
email: kcunha@on.br

For the XXXth IAU General Assembly in Vienna, Austria, in August 2018, we had the great opportunity to propose the Focus Meeting 7 (FM7) on *Radial metallicity gradients in star-forming galaxies* that was accepted with the endorsement and support of Division J (Galaxies & Cosmology) and of Division H (Interstellar Matter and Local Universe).

During this Focus meeting, we gathered different astrophysical communities and experts of different fields: from scientists interested in the resolved populations of our own Galaxy, to those focussed on extreme high-redshift galaxies, passing through large spectroscopic surveys in the local, intermediate- and high-redshift Universe. All these scientists have in common a strong interest in the study of radial metallicity gradients in star-forming galaxies, and each of them brings a different point of view, which is essential for a better understanding of all the facets of the topic. The aim of FM7 was to produce a global view of the state-of-art of our knowledge of radial metallicity distributions in galaxies.

We had 11 invited reviews, 19 contributed talks, which are published in this Volume, and about 30 posters, which are published in the on-line version. In what follows, we summarise the content of these proceedings, highlighting the major results.

The Milky Way (MW) is an ideal model testbed for our understanding of galaxy formation and evolution. We have learned from Laura Inno how Cepheids can trace the Galactic metallicity gradient even in the extremely obscured regions of the disk, until the borders of the disk and the bulge, while Jorge García-Rojas has described the latest determinations of radial abundance gradients obtained from the analysis of HII regions and planetary nebulae in our Galaxy point towards an interesting flattening of the gradient in the innermost regions.

In recent years we have witnessed a flourishing of large spectroscopy surveys of the stellar components of the MW. The results of some of the most important ones have been presented during FM7. Maosheng Xiang has shown us results from the LAMOST Galactic spectroscopic survey characterising the stellar metallicity distributions at different positions and for different ages were presented. We have learnt that *age evolution* is not a synonym of *time evolution* and that many processes are in between what we measure and what models predict. Sofia Randich has presented the results from the Gaia-ESO survey, with particular emphasis on the Galactic radial distribution of metals in open clusters, and how results from very young star clusters present new and challenging observational constraints to be considered by theoretical models. Jo Bovy has introduced new results on the global chemical and spatial structure of the disc from the APOGEE survey were presented, highlighting the importance of mergers during the Galactic evolution.

Also, we have seen a massive increment of high-quality observational spectroscopic data for galaxies of the local and far Universe. Results from the CHAOS project, presented by Danielle Berg, have increased, by more than an order-of-magnitude, the number of H II regions with high-quality spectrophotometry available to facilitate the first detailed measurements of the chemical abundances of a statistically significant sample of nearby disc galaxies to both understand their chemical evolution and to calibrate high-redshift observations. The low-redshift Universe as seen from SDSS-IV MaNGA, the largest integral field spectroscopic survey of nearby galaxies to date, has been presented by Francesco Belfiore, builds on the understanding of the interplay between inflows, star formation and feedback processes in galaxy evolution.

Simone Bianchi and Lisa Kewley have discussed different aspects of measuring the metal content in galaxies, including alternative ways to measure the metal content through the dust-to-gas mass ratio, with an extensive overview of the application of emission-line diagnostics for measuring metallicity gradients in galaxies, summarising the current state-of-art in metallicity determinations from empirical, theoretical and Bayesian statistical methods.

Finally, we had the opportunity to hear about results from theoretical models and comparisons with the observations. Ivan Minchev showed the results on the abundance gradient evolution of groups of stars with similar ages, the so-called mono-age populations, in galaxy formation simulations, stressing the importance radial mixing, disc flaring, and inside-out disc formation to understand both models and observations. Patricia Tissera has presented a summary of the current state-of-knowledge from a numerical point of view and she has discussed the main results from the analysis of the EAGLE simulations.

Results of the large spectroscopic surveys and of several large programs were presented by many speakers (Friedrich Anders, Enrique Pérez-Montero, I-Ting Ho, Laura Sánchez-Menguano, Jorge Barrera-Ballesteros, David Carton, Mirko Curt) together with results from less conventional tracers of the radial gradients, such as planetary nebulae (Sheila Flores Duran), blue and red supergiants (Lee Patrick) and DLA systems (Lise Christensen). Advances in theoretical models were also presented. (Mercedes Mollá, Fiorenzo Vincenzo, Francesca Fragkoudi, Lia Athanassoula). We also had exciting contributed talks on several topics, such as, isotopic ratios (Laura Colzi and Jiangshui Zhang) and the relation between dust and metals (Viviana Casasola).

We had a very stimulating and interesting Focus Meeting in Vienna, with more than 200 participants (we expected to have about 50 participants!). The interest on the topic was very strong and we even had several proposals for ensuing workshops on similar topics. It is a great pleasure to acknowledge the IAU Divisions J and H that supported us, the SOC for the help in selecting topics and speakers, and the IAU organisation for hosting us.

Laura Magrini, Letizia Stanghellini, Katia Cunha (co-Chairs and Editors of this Chapter)