THE MANGA FIREFLY CATALOGUE

IN PREP.
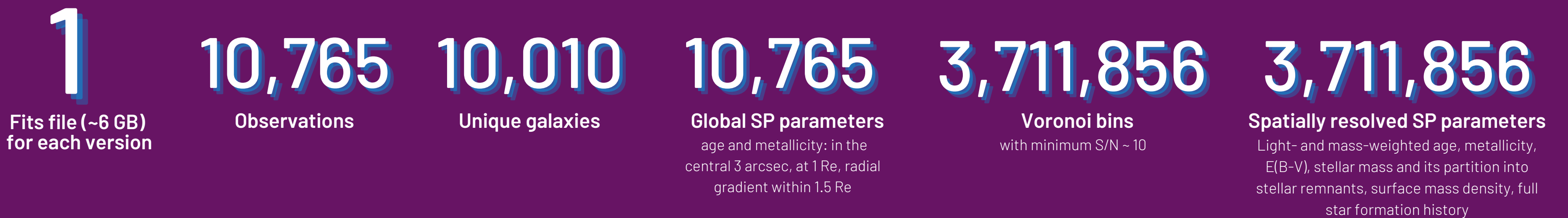
J. Neumann[1], D. Thomas[1,2], C. Maraston[1], L. Hill[1], J. Lian[3], J. Comparat[4], V. Gonzalez-Perez[5], K. Westfall[6]

justus.neumann@port.ac.uk

The MaNGA Firefly Value-Added-Catalogue (VAC) provides measurements of spatially resolved stellar population (SP) properties in MaNGA galaxies. It is built upon and complements the MaNGA data analysis pipeline (DAP; Westfall et al. 2019), which analyses the data produced by the data reduction pipeline (DRP; Law et al. 2016), and it employs the full spectral fitting code Firefly to derive parameters such as stellar ages, metallicities, masses, star formation histories and dust attenuation. In addition to Voronoi-binned measurements, it also provides global properties, such as central values and radial gradients. Here, we present an update on the MaNGA Firefly VAC that now doubled in sample size as compared to the version published in SDSS DR15 and comprises the complete final MaNGA sample (10,010 galaxies). One of the major new additions is the choice to select the results from fits that used either the MILES (Maraston & Strömbäck 2011) or the novel MaStar (Maraston et al. 2020) stellar population models, the later of which allow to constrain the fit over the whole MaNGA wavelength range.

RAW DATA → DRP → DAP → FIREFLY → VAC SCRIPT → FIREFLY VAC

1 Fits file (~6 GB) for each version

10,765 Observations

10,010 Unique galaxies

10,765 Global SP parameters
age and metallicity: in the central 3 arcsec, at 1 Re, radial gradient within 1.5 Re

3,711,856 Voronoi bins
with minimum S/N ~ 10

3,711,856 Spatially resolved SP parameters
Light- and mass-weighted age, metallicity, E(B-V), stellar mass and its partition into stellar remnants, surface mass density, full star formation history
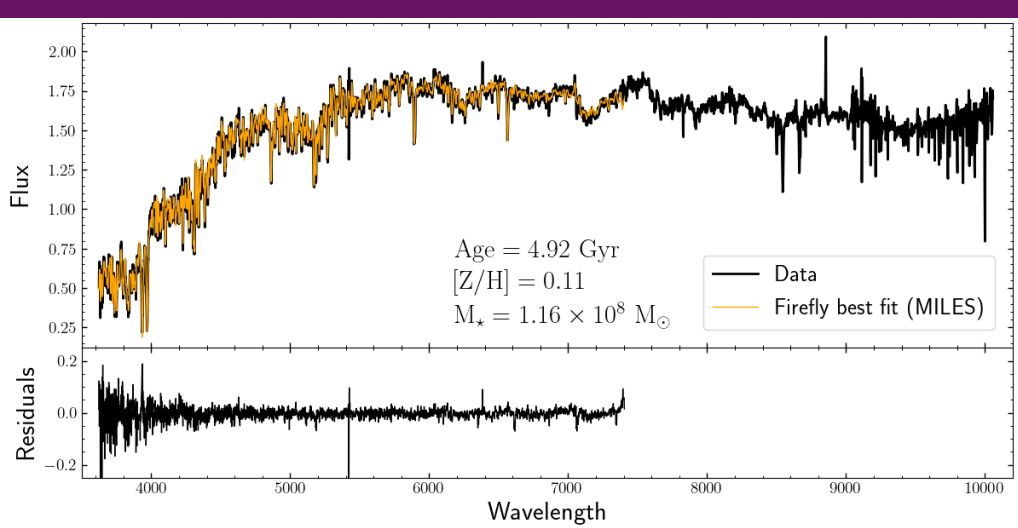
FIREFLY
a full spectral fitting code
(Wilkinson et al. 2017)

- Firefly is a chi-squared minimisation fitting code controlled by the Bayesian Information Criterion
- It fits combinations of single-burst stellar population models (SSPs) to spectroscopic data
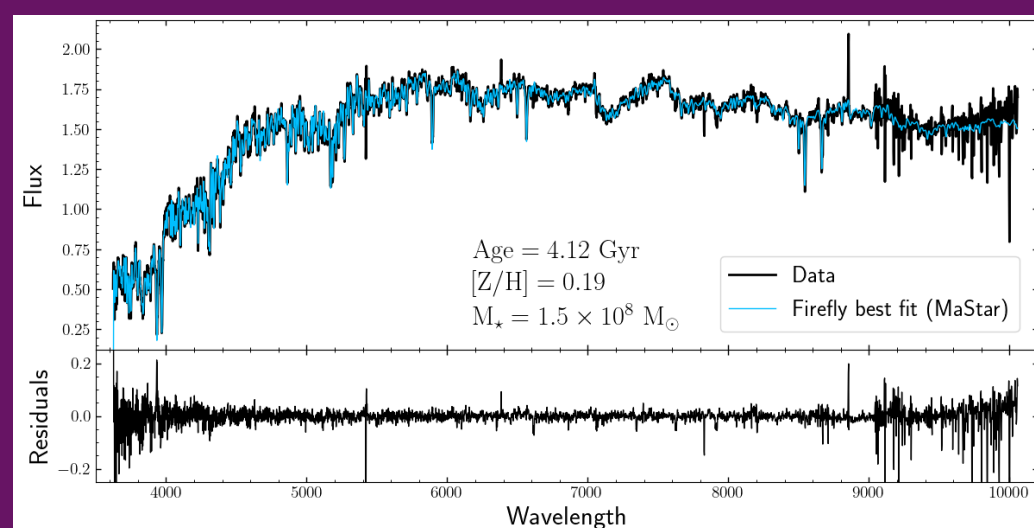- It provides non-parametric, non-regularised star formation histories

www.icg.port.ac.uk/firefly
www.github.com/FireflySpectra/firefly-release

Fits using MILES SSPs

Age = 4.92 Gyr
[Z/H] = 0.11
$M_\star = 1.16 \times 10^8\ M_\odot$

Fits using MaStar SSPs
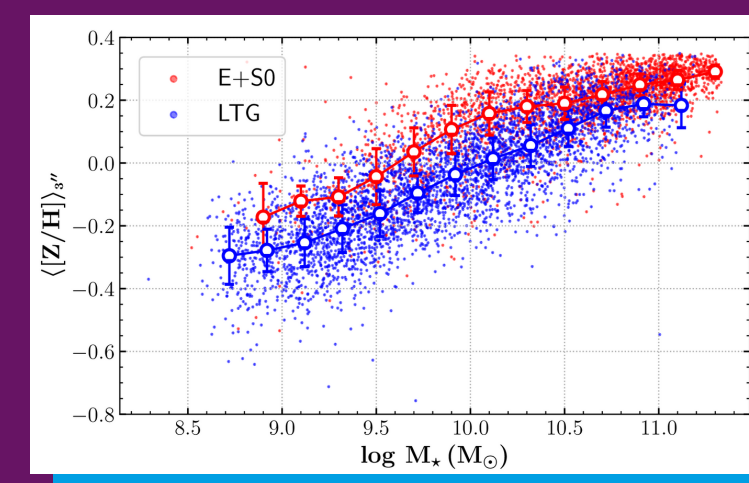

Age = 4.12 Gyr
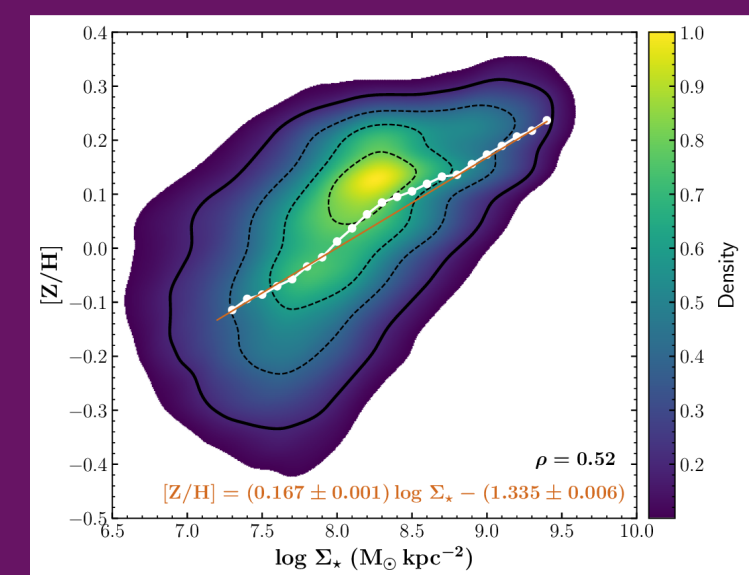[Z/H] = 0.19
$M_\star = 1.5 \times 10^8\ M_\odot$

Science application based on the MaNGA Firefly VAC

"Drivers of stellar metallicity in nearby galaxies" (Neumann et al. in prep.)
Live Talk on Thursday!

Global mass-metallicity relation. The scatter points represent individual galaxies (~8100) and the line plot show median [Z/H].

Spatially resolved stellar surface mass density-metallicity relation. Density plot of all spatial bins out to maximal 2.5 Re (~2.5 million). In white we show median [Z/H] and in green a linear regression.

$[Z/H] = (0.167 \pm 0.001) \log \Sigma_\star - (1.335 \pm 0.006)$

Examples of 2D SP maps from the VAC