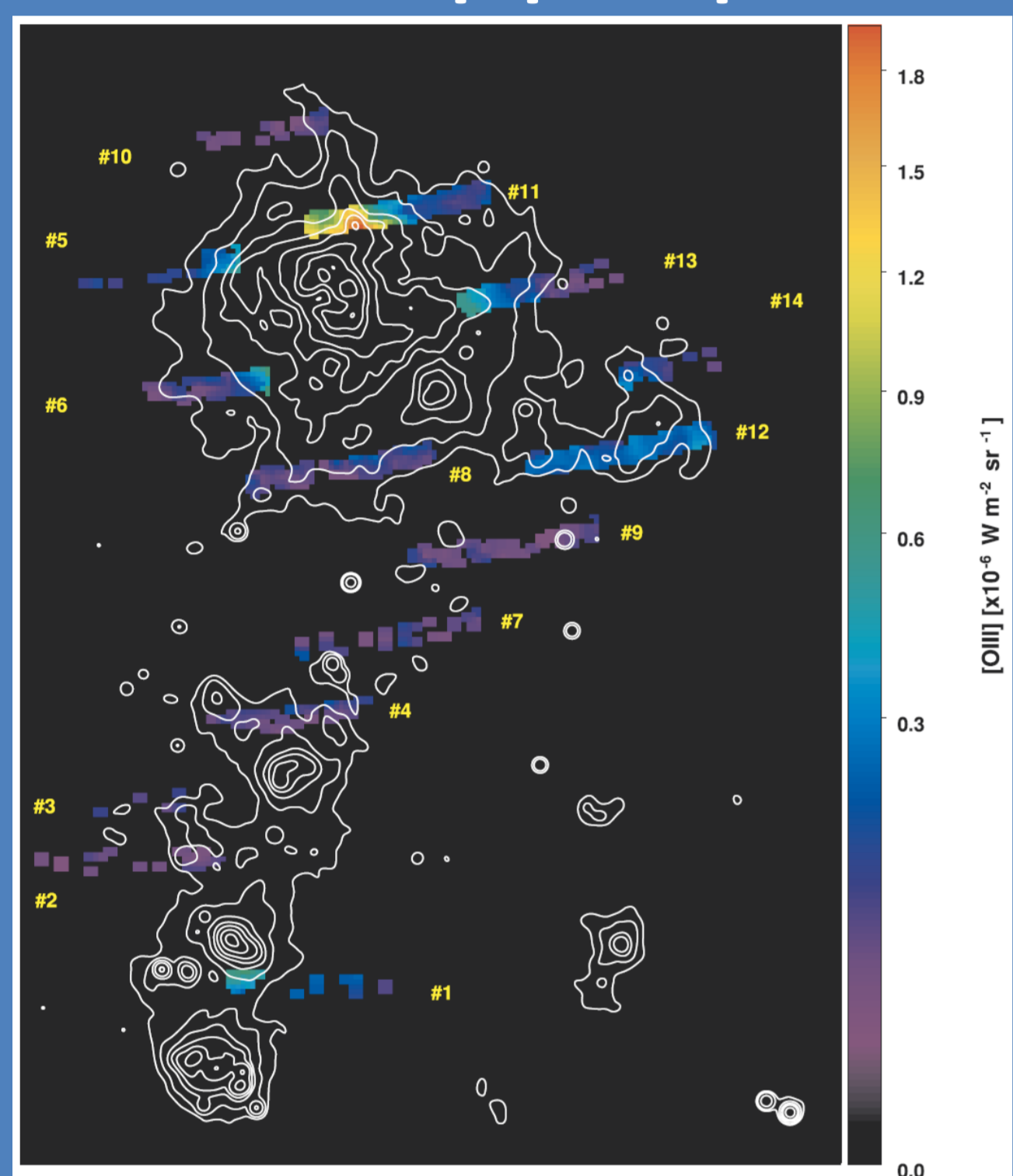


Far-Infrared [OIII] 88 μm emission line of very high redshift low-metallicity galaxies

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I. FIR [OIII] emission lines

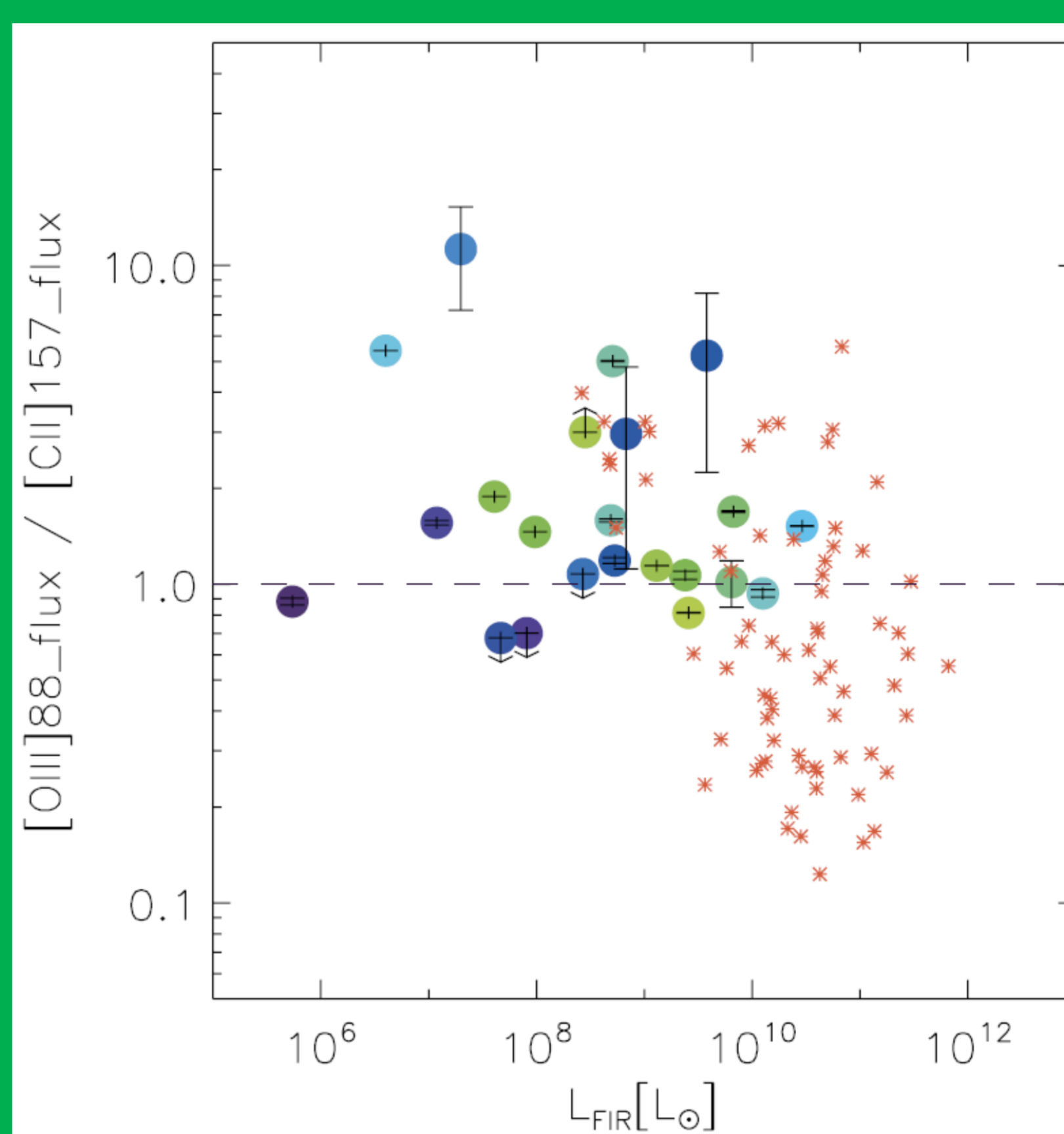
In the local Universe, [OIII] 52/88 micron emission lines are well-known very strong lines from HII regions in the FIR regime, whereas detections at high-redshift have been rare because of the lack of appropriate instruments.



Color contour: AKARI/FIS detection of the spatially extended [OIII]88 line in the LMC 30 Doradus. White contour: Spitzer/MIPS 24 micron. (Kawada et al. 2011)

II. [OIII]88 in low-metallicity ISM

Herschel collected FIR emission line data from nearby low-metallicity dwarf galaxies and showed that the [OIII]88 line was stronger than the [CII]158 line in the low-metallicity galaxies.

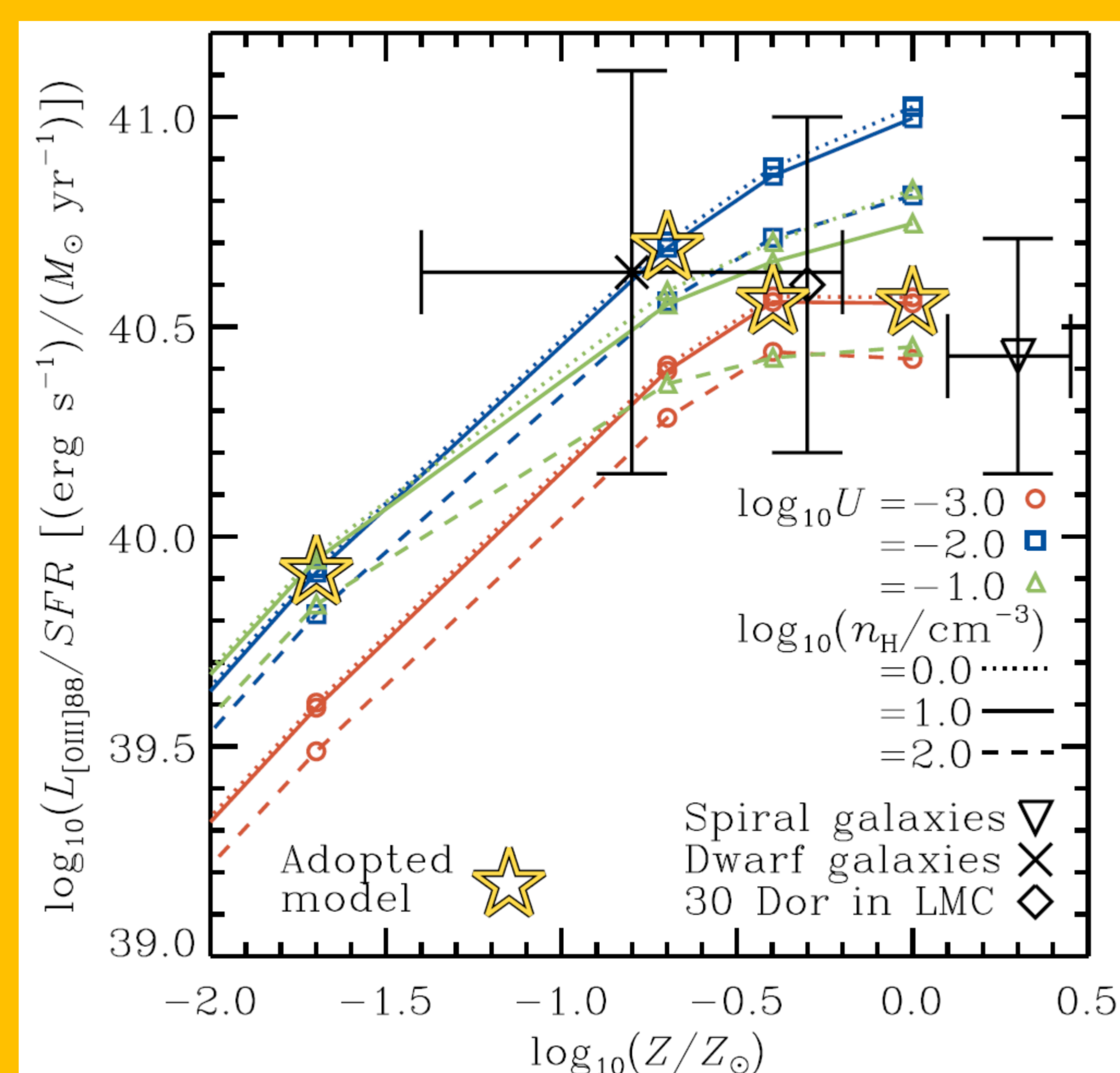


Blue and green data are low-metallicity dwarf galaxies, while red points are high-metallicity normal galaxies. (Madden et al.2012)

III. [OIII]88 line model

Using the Cloudy code, we have made a model of FIR line emissivity as a function of metallicity.

Cloudy calculations are shown by colored points with lines. Black points with error-bars are observational data taken in the nearby Universe. Stars are the fiducial model.



IV. [OIII]88 line in the early Universe

A cosmological hydrodynamics simulation with the line emissivity model predicts the existence of a lot of strong [OIII]88 line galaxies at $z > 7$. Bright ones can be detectable by a few hours integration with the ALMA band 7.

Predicted [OIII]88 line flux and intensity of galaxies at $z > 7$ as a function of the apparent H160 band magnitude.

