# Revealing the Violent Universe with FMOS

**JSPS Case Study**

**Description:** The Fibre Multi-Object Spectrograph (FMOS) was built by a Japan-UK collaboration (Kyoto University, The National Astronomical Observatory of Japan (NAOJ), The University of Oxford, The University of Durham, and the UK Science and Technology Facilities Council. The instrument is located on NAOJ's 8.3m telescope on the island of Hawai'i and provides simultaneous infrared spectroscopy of up to 400 individual astronomical targets within a half-degree field on the sky. The instrument was commissioned in 2009, and the JSPS programme, awarded in December 2009, began as a scientific follow-up to the instrumentation programme, and was aimed to facilitate the design and submission of a large collaborative research programme to provide the best scientific exploitation of this unique instrument. The programme requested JSPS funding of 5M¥ for travel of Japanese participants to the UK, and involved researchers from:

Kyoto University
Tohoku University
NAOJ, Mitaka
NAOJ, Hawai'i
University of Tokyo
Ehime University

The University of Oxford
Edinburgh University
The University of Durham
The University of Nottingham
The University of Hertfordshire
Liverpool John Moores University
The Rutherford Appleton Laboratory

Along with a number of individual travel visits, the main event of the programme was a workshop held in Oxford, UK, in July 2010 with 22 participants. This workshop finalised the proposal for a large survey programme, which was reviewed by the Subaru telescope Science Advisory Committee, and approved in the Summer of 2011. The project (FASTSOUND) has been allocated 40 nights of time with Subaru to obtain spectra of up to 30,000 faint galaxies at a time when the Universe was roughly half it's present age. The relative positions of these galaxies can be used to determine a measure of the rate of growth of Cosmic Structure in this epoch, and to place constraints of the evolution and nature of the phenomenon that is commonly known as Dark Energy.

To date there are three joint scientific papers directly arising from this collaboration, based on initial data that was obtained to help with defining the final survey parameters. Full survey observations began in September 2011 and will extend through to May of 2013.

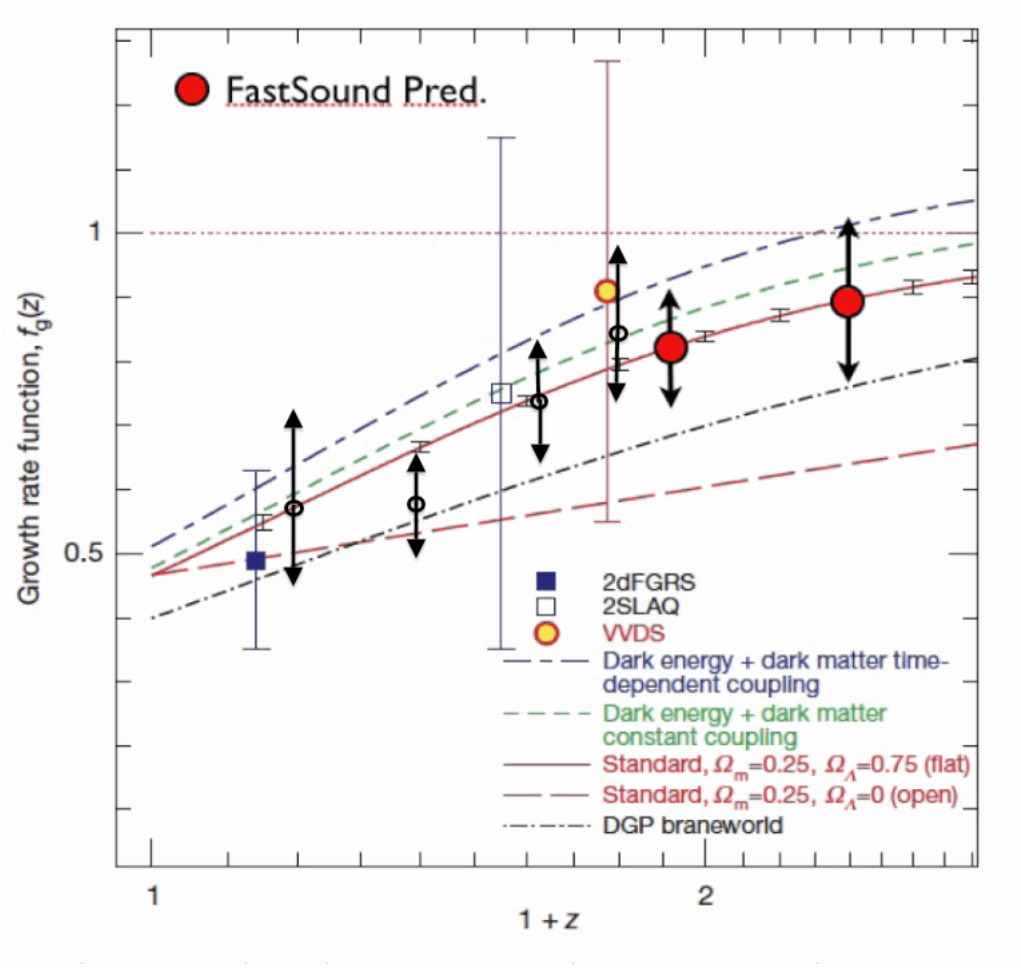


**Figure 1: Predictions for the FASTSOUND survey illustrating how the growth rate of Cosmic Structure can be expored to greater distances than has previously been been possible, thanks to the unique wide-field infrared spectroscopic survey capabilities of FMOS.**

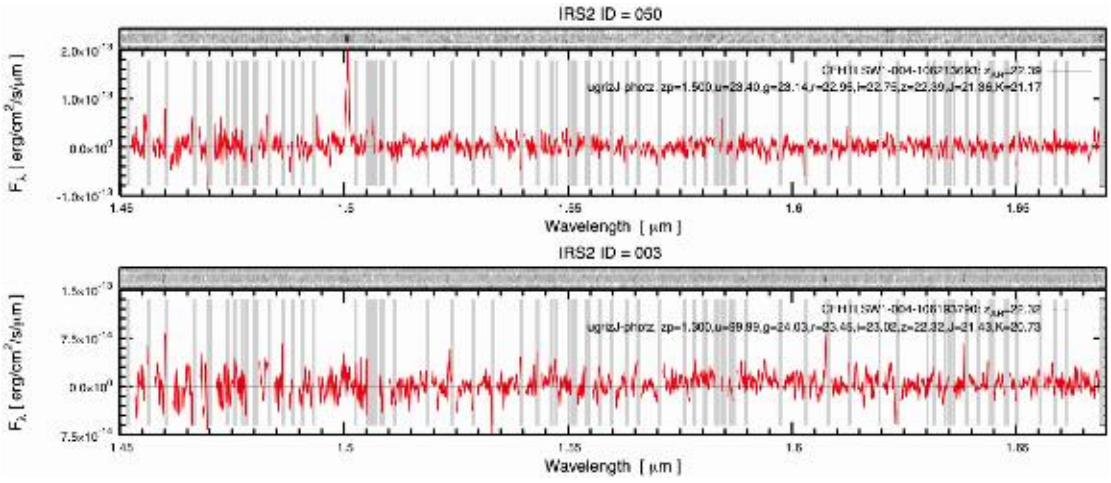


**Figure 2: Sample spectra from the FMOS instrument, showing the difficulty of achieving observations of faint galaxies in the infrared region of the spectrum: The grey lines show the spectral locations of bright emission features in the night sky spectrum that are masked out within the FMOS instrument. The upper spectrum shows a strong single emission line from the galaxy, which is identified as Hydrogen emission at a rest wavelength of 656.3nm, observed redshifted to 1502nm. The lower spectrums exhibits a similar feature at 1608nm that is partially clipped by the sky mask, making accurate identification a time-consuming interactive task for these observations.**