Circumnuclear star formation in Mrk 42 mapped with Gemini Near-infrared Integral Field Spectrograph

Moire G. Hennig et al. 2018

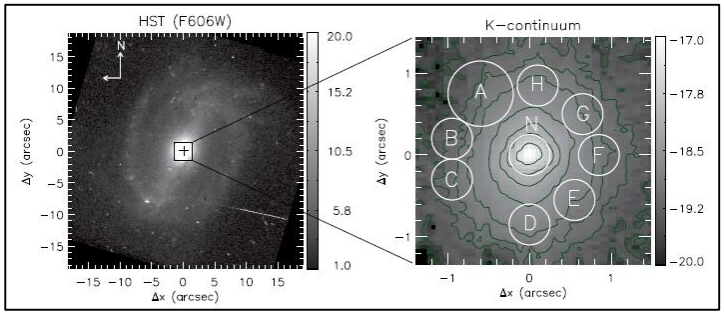
Astro-phゼミ 河野志洋 2018/04/03

ABSTRACT

We present Gemini Near-infrared Integral Field Spectrograph (NIFS) observations of the inner 1.5×1.5 kpc^2 of the narrow-line Seyfert 1 galaxy Mrk 42 at a spatial resolution of 60 pc and spectral resolution of 40 km s^{-1}. The emission-line flux and equivalent width maps clearly show a ring of circumnuclear star formation regions (CNSFRs) surrounding the nucleus with radius of $\sim$500 pc. The spectra of some of these regions show molecular absorption features which are probably of CN, TiO or VO, indicating the presence of massive evolved stars in the thermally pulsing asymptotic giant branch (TP-AGB) phase. The gas kinematics of the ring is dominated by rotation in the plane of the galaxy, following the large scale disk geometry, while at the nucleus an additional outflowing component is detected blueshifted by 300-500 km s^{-1}, relative to the systemic velocity of the galaxy. Based on the equivalent width of Brγ we find evidences of gradients in the age of H II regions along the ring of Mrk 42, favoring the pearls on a string scenario of star formation. The broad component of Paβ emission line presents a Full Width at Half Maximum (FWHM) of $\sim$1480 km s^{-1}, implying in a mass of $\sim 2.5 \times 10^6$ M$_\odot$ for the central supermassive black hole. Based on emission-line ratios we conclude that besides the active galactic nucleus, Mrk 42 presents nuclear Starburst activity.

Key words: galaxies: individual (Mrk 42) – galaxies: active – galaxies: ISM – infrared: galaxies

図1



・観測

NIFSのJ, H, K band w/ AO
Mrk42(Seyfert 1)の1.5kpc四方

・イントロ

多くの渦巻銀河はCNSFRを持つ
中心核へのinflowが原因？
SMBHと母銀河の共進化に関係
CNSFRの形成過程を知りたい

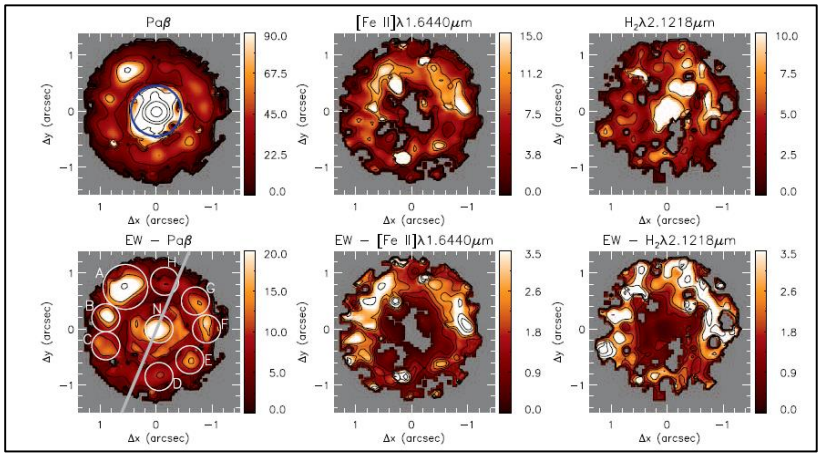
・CNSFR探査

Paβ⇒8つのCNSFRを発見(図4)
[FeII], H2は異なる分布

・励起メカニズム(図5)

[FeII], H2, 結合線を用いた診断
⇒比が小さく、星形成に起因

図4



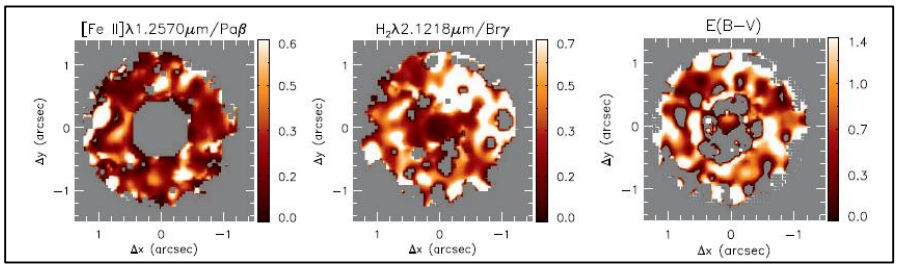


図5

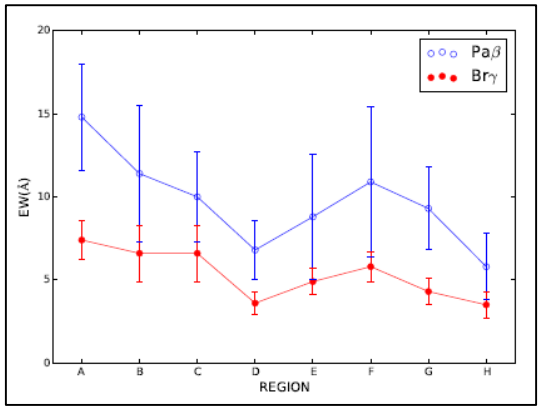


図8

・CNSFR形成過程(図8)

二つのシナリオ
⇒“popcorn”, “pearls on a string”

各CNSFRの年齢から判定できる
⇒二つの傾きがみられる？
しかし, E, F, Gには年老いた星
⇒”popcorn”を示唆か