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Bidimensional [O III] λλ4959, 5007 Spectroscopy in the Circumnuclear Region of the Active Galaxy NGC 1068

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Abstract. We present preliminary results about the velocity field of the ionized gas in the central region of NGC 1068, inferred from the [O III] λλ4959, 5007 emission lines. The data, 570 spectra in the inner $23'' \times 18''$ of this galaxy, were obtained with an optical fiber system which allows 2-D spectroscopy. The velocity field for the ionized gas inferred from the [O III] lines is in good agreement with recent results based on the Hα+[N II] lines.

The velocity field of the ionized gas in NGC 1068 is well described by a rotating disk for $r > 15''$ (Kaneko et al. 1992, and references therein); however, the innermost region (say, $r < 10''$) is very complex, as several gaseous components are present, and radial motions seem to be important (e.g., Cecil, Bland, & Tully 1990).

Recently, Arribas, Mediavilla, & García-Lorenzo (1996) have studied the kinematics and the ionization structure in the central $8'' \times 10''$ of NGC 1068 on the basis of bidimensional Hα+[N II] spectroscopy obtained with an optical fiber system. They performed a kinematic decomposition which allowed them to distinguish the main components of ionized gas. Studying the intensity distributions and the velocity fields of these individual components, a biconical (or bipolar) structure in the inner region of NGC 1068 was found. The center/apex of this structure, which is coincident with the kinematic center for the ionized gas, was suggested to be the location of the hidden nucleus in NGC 1068.

Here we present preliminary results based on new data on the circumnuclear region of NGC 1068. These observations were obtained with the 2D-FIS fiber system (García et al. 1994) in combination with the 4.2-m WHT. The field of view of the fiber bundle is about $12'' \times 9''$, but we took six exposures to cover the inner $\sim 23'' \times 18''$ of the galaxy. In this region, we obtained 570 spectra in each of the two arms (blue and red) of the ISIS spectrograph (plus 180 spectra at outer zones, intended to collect the sky background). The spectra from the blue arm have a resolution of 2.5 Å and cover the spectral range 4175–5749 Å. For the red arm, the corresponding values are 5 Å and 6260–9465 Å, respectively. Thus, they cover a larger angular area and spectral range than our previous work.

In the present communication, we focus on the [O III] λλ4959, 5007 emission lines. For $r < 10''$, these lines show very complex profiles, especially NE and SW of the optical nucleus, whereas the profiles are narrow and show no signs of multiple components outside this region. In any event, the [O III] lines observed here are more suited than the blended Hα+[N II] lines used in previous works to accomplish line-profile decomposition. The preliminary results obtained in this

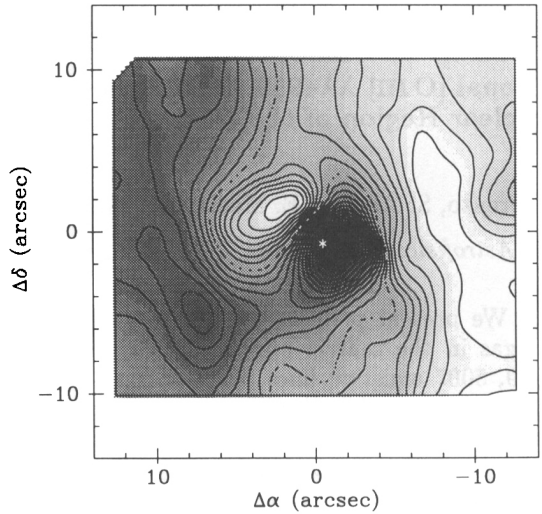

Figure 1. Velocity field of the ionized gas in the circumnuclear region of NGC 1068 inferred from cross-correlation in the range 4800–5150 Å from 2D-FIS data. The asterisk marks the location of the optical nucleus. The isovelocity lines span 860–1300 km s^{-1} in steps of 20 km s^{-1}. The dashed line corresponds to the systemic velocity of the galaxy (1137 km s^{-1}). Black corresponds to lowest velocities.

respect agree with those previously obtained. The 'integrated' velocity field of the ionized gas inferred from the [O III] lines is presented in Fig. 1. It is also in good agreement with the 'integrated' velocity field inferred from the Hα+[N II] lines. Note that the kinematic center is about 1″ NE of the optical nucleus.

References

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