Spectroscopy of the High Redshift Radio-galaxy 3C65

The understanding of high redshift radio-galaxies has been so far mostly based upon deep photometric data. Two crucial properties have been identified for these objects: (i) the optical (rest UV) emission is quite often aligned with the radio source axis ((McCarthy et al., Chambers et al.), and (ii) the K-z Hubble diagram shows a quite tight relation with a spread in magnitude of only 0.4 mag at z=1 (Lilly, 1989). Models based on the mix of stellar populations with different ages have been proposed to explain these properties. One model calls for a "two-component" origin for the light between 2500Å and 11000Å (rest), in which an old (>3Gyr) stellar component dominates the K band flux at z~1, while young stars account for most of the UV flux (Lilly, 1989, *Ap.J.*, **340**, 77) and would align with the radio axis because of enhanced star formation along the jet as the correlation between optical and radio morphologies seem to indicate (McCarthy et al). Another model emphasizes the contribution from red supergiant stars to the initial mass function, and uses the photometric color indexes as an indication of their ages (Chambers and Charlot, 1990, *Ap.J.*, **348**, L1). Yet another stellar model, put forward by Bithell and Rees (1990, *MNRAS*, **242**, 570), assumes an extremely young (10^7 yr) stellar component.

Recent results (Hammer, Le Fèvre, Angonin, 1993, *Nature*, **362**, 324) have shown that spectra of most of the high redshift radio-galaxies in the 3CR catalog, with redshifts between 0.8 and 1.1, do not exhibit spectral signatures expected from either old or very young stars. However, one of the objects not observed in the study of Hammer et al. is 3C65, the reddest object in the sample of high redshift 3CR galaxies. It has been claimed that this object should have a very significant contribution from old stars. If so, this contribution should show in the spectral energy distribution, with a significant break in the flux at around 4000Å. To explore this possibility, a total of 2h20 of integration has been obtained with the MOS in September 1993. The spectral resolution was 22Å with the R300 and a 2 arcsec slit. The spectrum is shown in figure 13. The vertical dotted line represents the expected location of the 4000Å break redshifted to z=1.176. One can see that no significant break is observed, therefore indicating a marginal contribution from old stars to the light.

This observation confirms the results of Hammer et al. One feels now constrained by the data to explore physical processes other than pure stellar populations to explain the origin of the light. A dominant contribution from scattered light from a central engine seems to be one of the possible explanations to the continuum so far observed around 4000Å.

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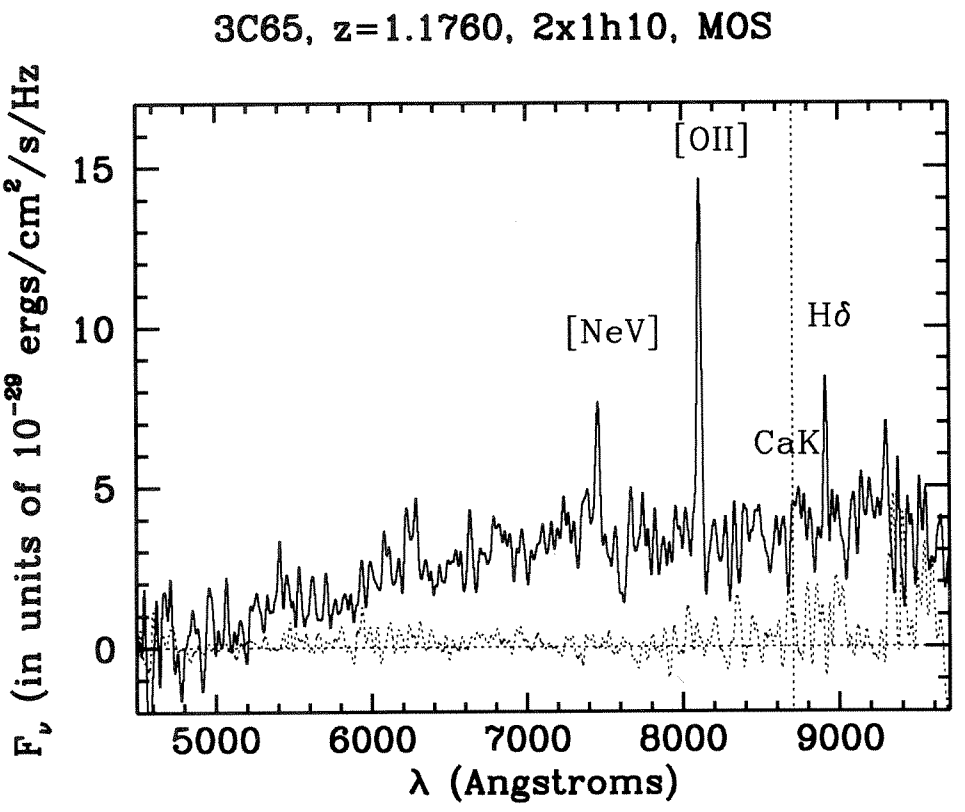

Figure 13.

Nucléosynthèse: le problème des éléments à processus-r

La formation des éléments

Les étoiles sont le siège de processus de fusion nucléaire qui non seulement fournissent l'énergie nécessaire au rayonnement mais transforment des éléments chimiques en éléments plus lourds. Les conditions et les sites de formation de la plupart des éléments sont maintenant relativement bien connus. Cependant, les éléments plus lourds que A=70 ne sont plus formés par fusion mais par bombardement de neutrons sur des noyaux cibles de fer en fonction du flux de neutrons. On assiste principalement a deux types de formation d'éléments: éléments à processus-s lorsque le flux de neutron est faible comparé à la désintégration bêta et éléments à processus-r lorsque le flux de neutron est important. Une des difficultés dans la recherche de sites de formation des éléments lourds est que dans les phases principales de fusion, les neutrons libres ne sont pas importants. Il faut donc trouver des con-