X02a   New insight into the role of AGNs in forming the cluster red sequence

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The Spiderweb protocluster at $z = 2.2$ is one of the best studied protocluster so far, based on huge investments from various telescope facilities. We report here the latest results in this field, adding a new dimension to previous research on cluster formation at high redshift. Prior studies have reported a significant overdensity of massive $H\alpha(+[\text{NII}])$-emitting galaxies, which were previously thought to be dusty, active star-forming galaxies given their rest-frame optical and infrared features. However, this paper argues that a third of them are more likely to be "passively-evolving" galaxies with AGNs rather than star-forming galaxies, judging from the multi-wavelength SED fit with the X-ray module. The bulk of their $H\alpha+[\text{NII}]$ emission would come from the central AGNs to explain their SED-based star formation rates. Such a different interpretation between this work and past studies, including ours, is particularly supported by the recent deep Chandra/X-ray observation. Furthermore, we have spectroscopically confirmed such a quiescent nature for one of them, with its multiple stellar absorption lines but with [NII] emission lines. This important update provides a new insight into the role of AGNs in forming the cluster red sequence observed in the present-day universe.