SDSS J141324.27+530527.0: a New "Changing-look" Quasar with "Turn-on" Transition

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ABSTRACT

We identify SDSS J141324+530527.0 (SBS 1411+533) at z=0.456344 as a new "changing-look" quasar with a "turn-on" spectral type transition from Type-1.9/2 to Type-1 within a rest-frame timescale of 1–10 yr. The 2003 SDSS spectrum is dominated by a starlight emission from host galaxy redward of the Balmer limit, and has a non-detectable broad Hβ line. The new spectrum taken by us on 2017 June 1 indicates that the object has a typical quasar spectrum with a blue continuum and strong Balmer broad emission lines. The timescale argument allows us to believe the revealed type transition is possibly caused by either a viscous radial inflow or a disk instability around a ~(5–9)×10^7 $M_\odot$ black hole.

1. Introduction

As a challenge to the unified model, the type transition phenomena (Changing-look, CL) in AGNs is of particular importance. It enables us to study: (1) the accretion physics around central SMBHs; (2) the host galaxy of a luminous AGN, which is necessary for studying the coevolution of the SMBH and host galaxy, especially at high redshift; and (3) the lifetimes of AGNs.

So far, only about 40 CL-AGNs have been found in previous studies [1-3]. The origin of CL AGNs is still under hot debate. Possible explanations include: (1) a variation of the obscuration; (2) a variation of SMBH accretion rate; (3) an accelerating outflow launched from the central SMBH; and (4) a tidal disruption event (TDE).

2. Observation, Data Reduction and Identification

With the new spectrum taken by the P200 telescope at 2017/06/01 and standard data reduction procedure, we identify a "turn-on" type transition from type 2/1.9 to type 1, as shown in Figures 1 and 2.

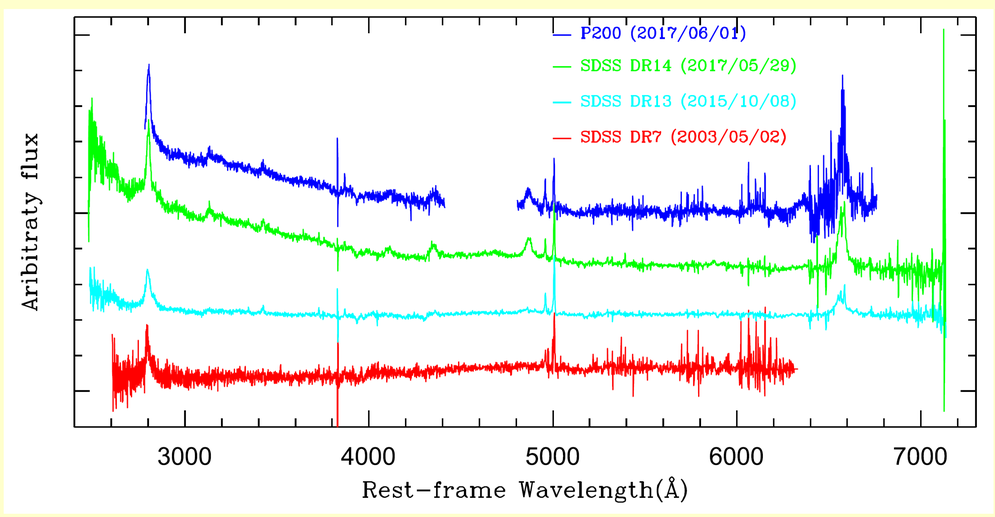


Figure 1. Comparison of the new spectrum taken by the P200 telescope and the spectra extracted from the SDSS.

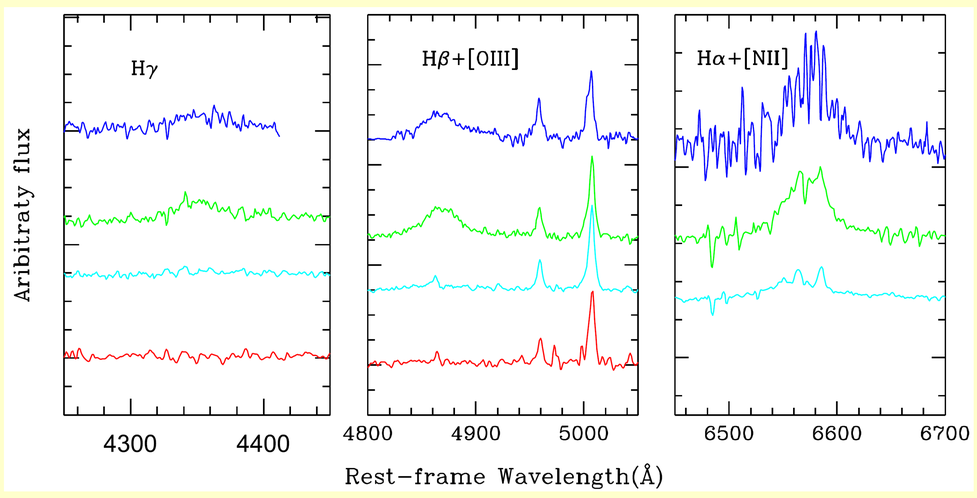


Figure 2. Comparison of the Balmer emission line profiles, after the AGN's continuum and underlying host galaxy emission are removed.

3. Spectral Analysis

The modeling of the spectra can be found in Figures 3.

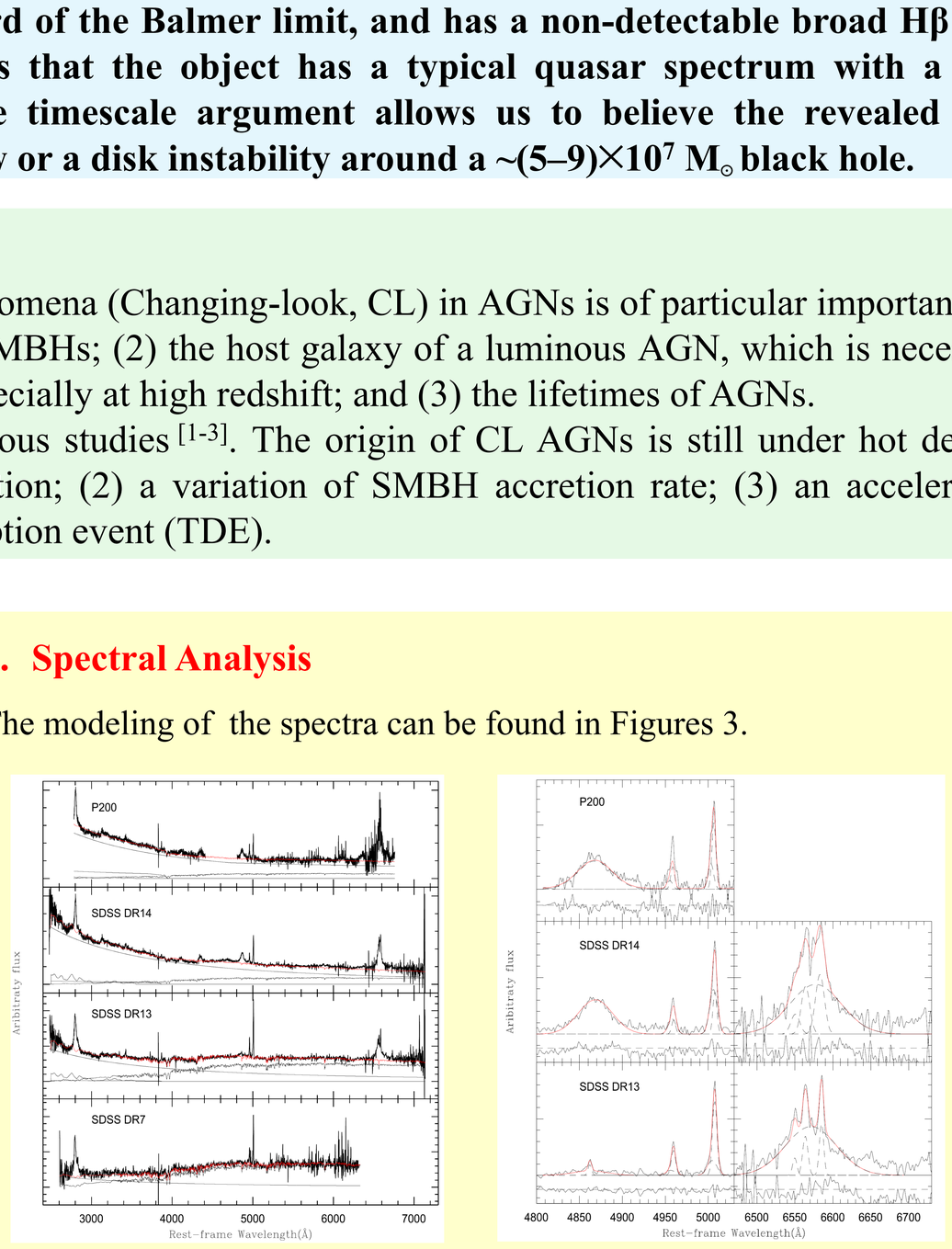
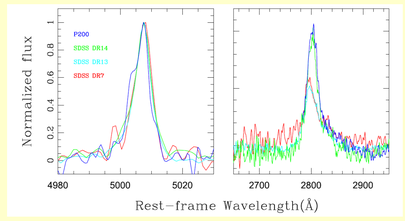


Figure 3. *Left*: Modeling and removal of the continuum. *Right*: Line profile modeling by a linear combination of a set of Gaussian functions.

4. Results and Implications

A new CL quasar with M_{BH} ~5-9×$10^7 M_\odot$ shows a "turn-on" type transition from Type-2/1.9 to Type-1 within a rest frame time scale of 1-10 years [4].

- **Proposed mechanisms**
  - **×Var. of obscuration**
  - **×Outflow**
  - **×TDE**
  - **✓Viscous radial inflow**
  - **✓Disk instability**



Line ([OIII] and MgII) profile comparison

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