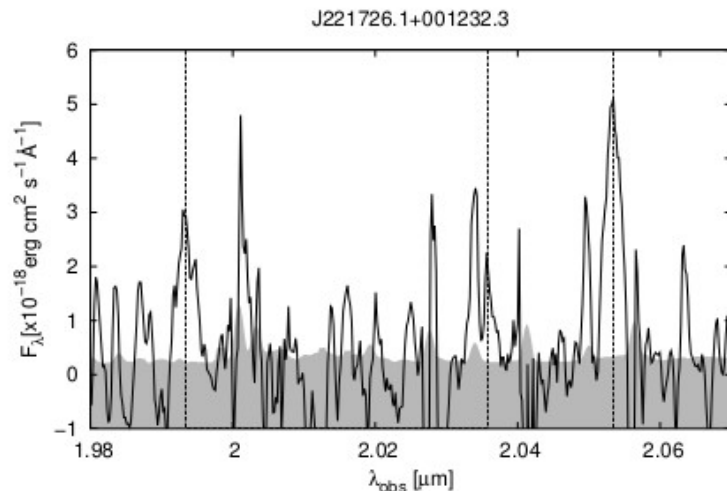


The massive quiescent galaxies in the protocluster at $z=3.09$

Mariko Kubo (D3,
Tohoku Univ) et al.

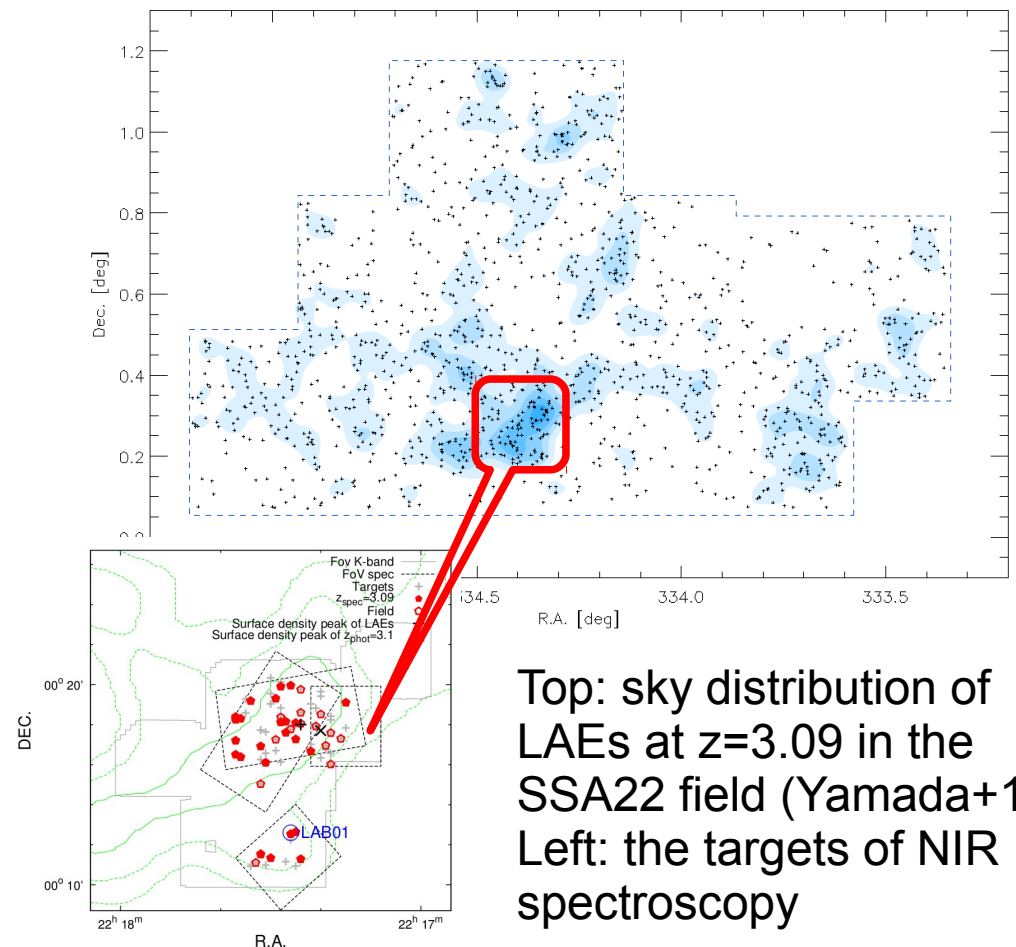
We studied the protocluster at $z=3.09$ in the SSA22 field by using NIR imaging and spectroscopic data taken with Subaru MOIRCS.



Example of the spectrum at 2um

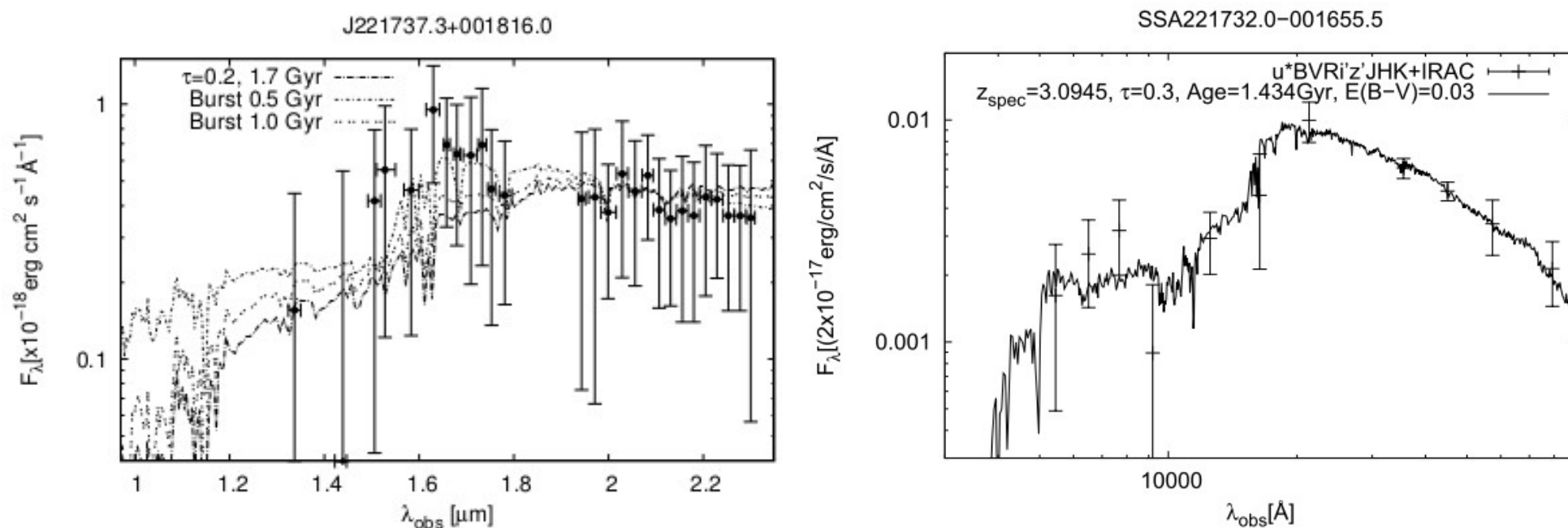
The core of the protocluster
was observed.

24 out of 67 targets are at
 $z_{\text{spec}}=3.04-3.12$



Top: sky distribution of
LAEs at $z=3.09$ in the
SSA22 field (Yamada+12)
Left: the targets of NIR
spectroscopy

- From the spectral energy distribution (SED) fitting, we found that the five reddest ($J-K_{AB} > 2.4$) galaxies in the protocluster have the SEDs dominated by old stellar population (Burst like SFH, Age > 1.4 Gyr, $M_s \sim 10^{11} M_{\text{sun}}$).
- This may be for the first time to confirm the association of massive quiescent galaxies with the protocluster at $z > 3$.



(Left) Continuum spectrum of a quiescent galaxy at $z_{\text{cont}} \sim 3.1$.

(Right) Examples of the rest-frame UV to NIR SED of the quiescent galaxies in the SSA22 protocluster.