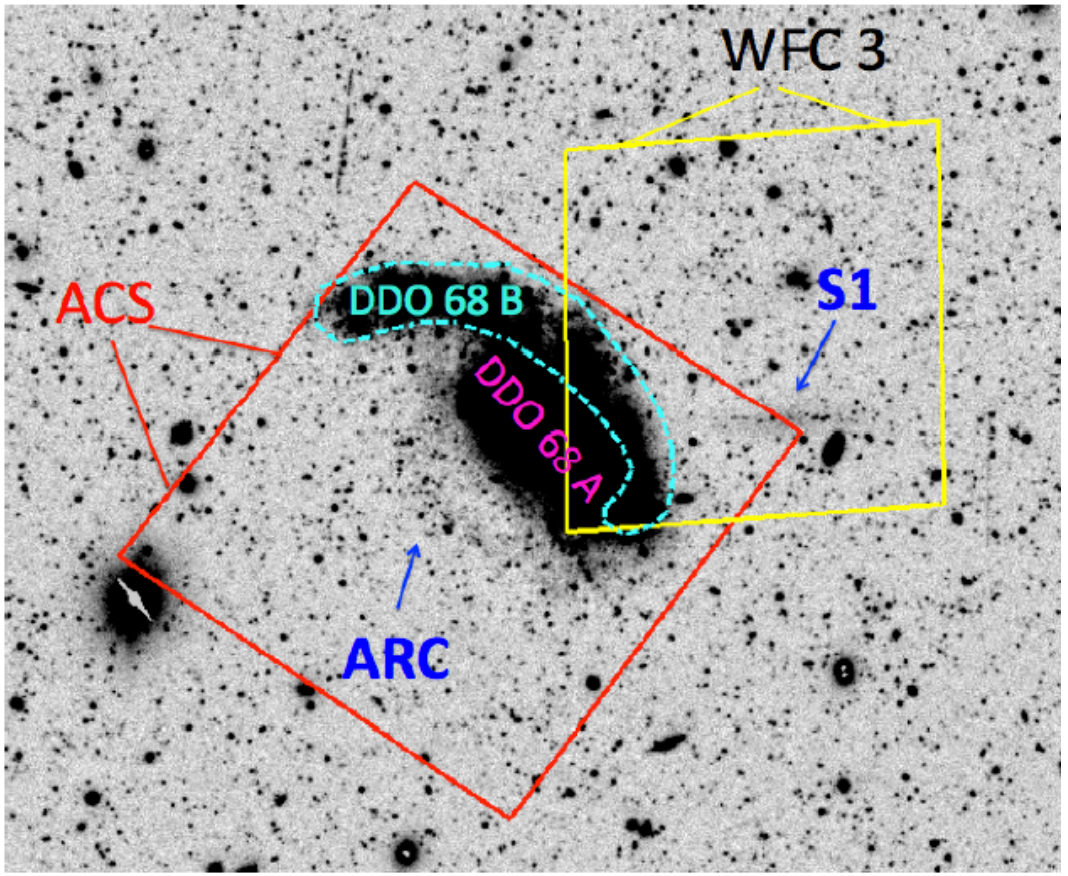
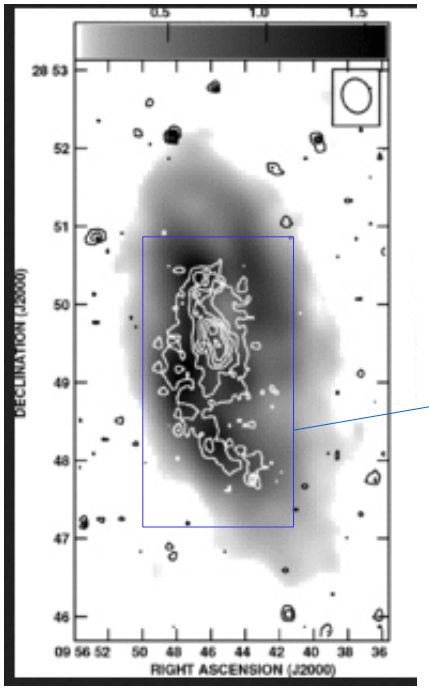
HST resolves stars in a tiny body falling on the dwarf galaxy DDO 68

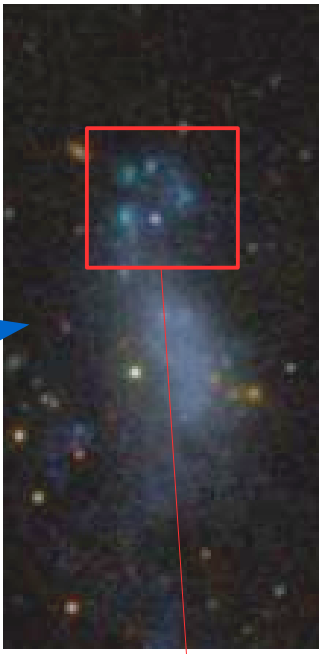
F. Annibali,[1] M. Bellazzini,[1] M. Correnti,[2] E. Sacchi,[2] M. Tosi,[1] M. Cignoni,[3,4] A. Aloisi,[2] D. Calzetti,[5] L. Ciotti,[6] F. Cusano,[1] J. Lee,[7] and C. Nipoti[6]

ArXiv:1904.019866

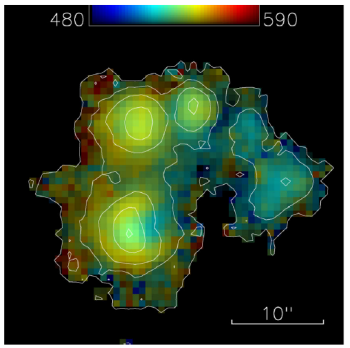
Ekta, Chengalur, Pustilnik (2008) – HI







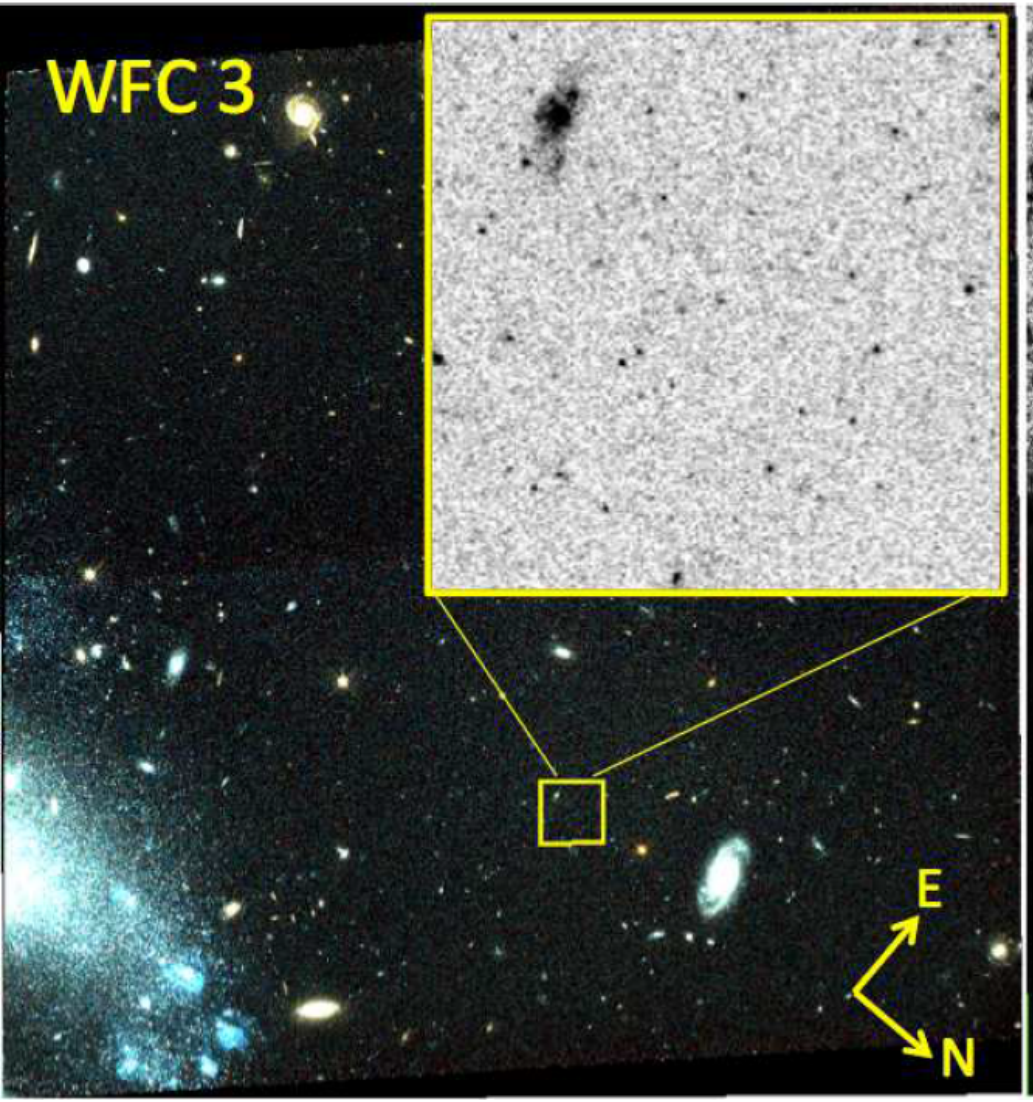
S. A. Pustilnik et al.

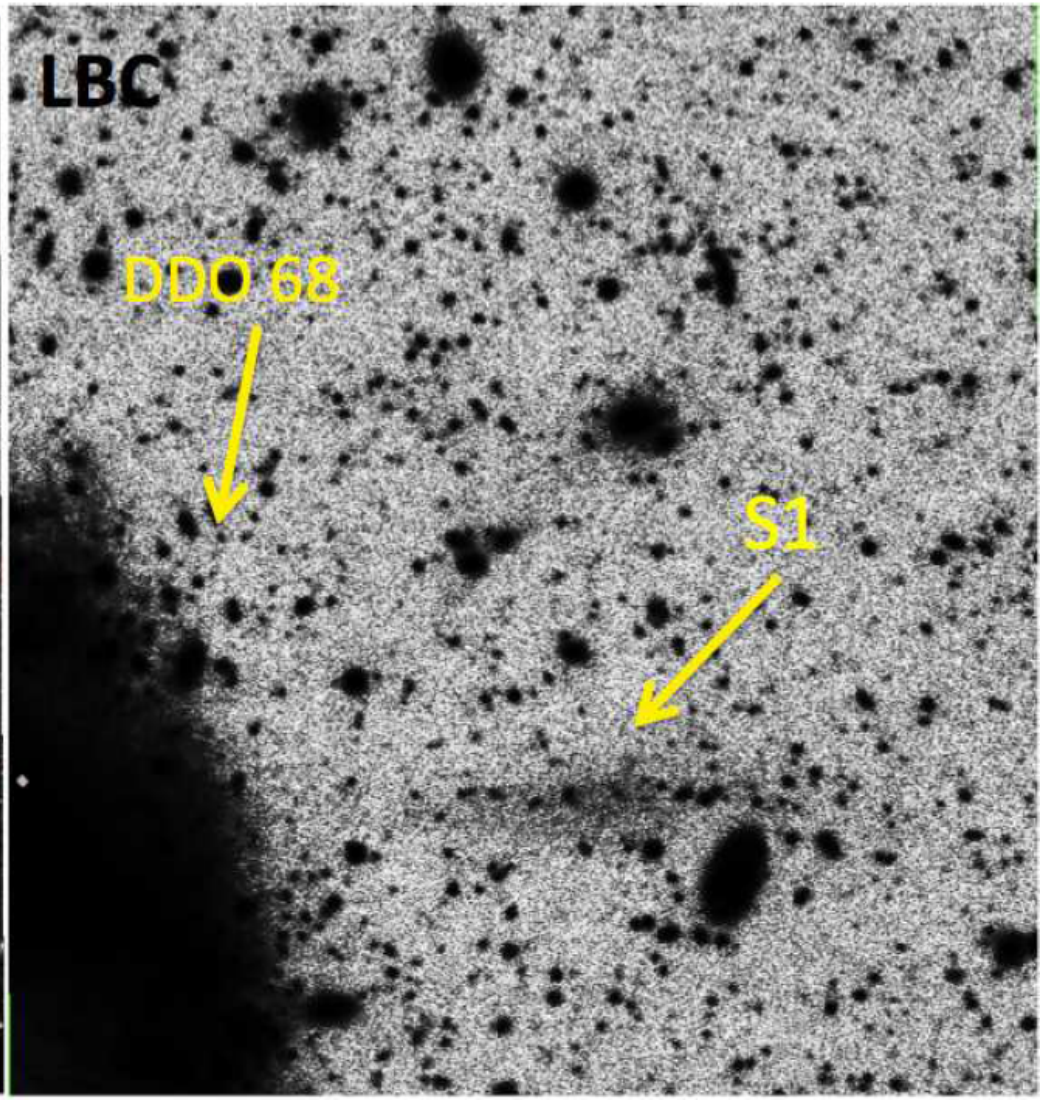


12+log (O/H) = 7.14
Z=Zo/35

Tikhonov, Galazutdinova, & Lebedev (2014):
HST: A (Zo)/5+ B(Zo/20)

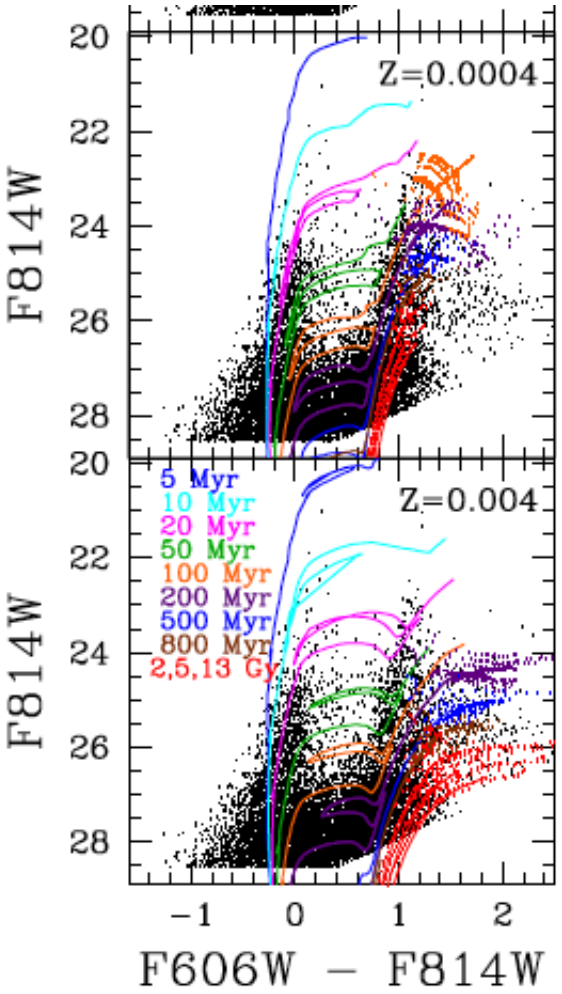
HST vs LBT

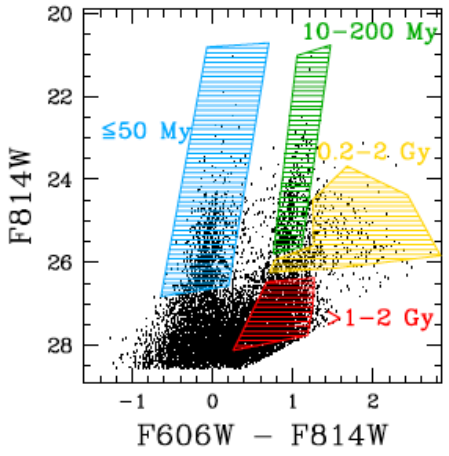


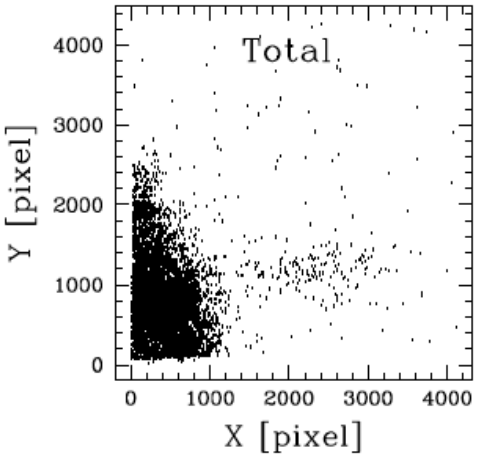


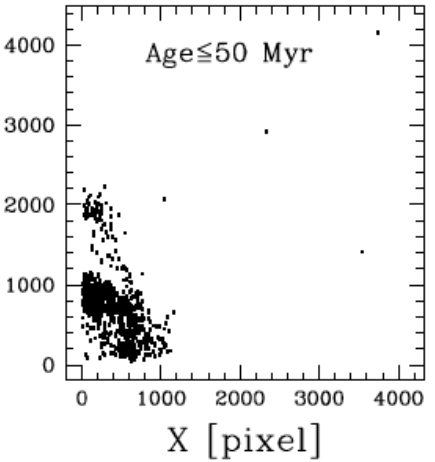
tected in the ACS images are in fact part of a more extended low surface brightness ($\mu_r \sim 28.7$ mag arcsec^{-2}) stream-like system connected to DDO 68, which we

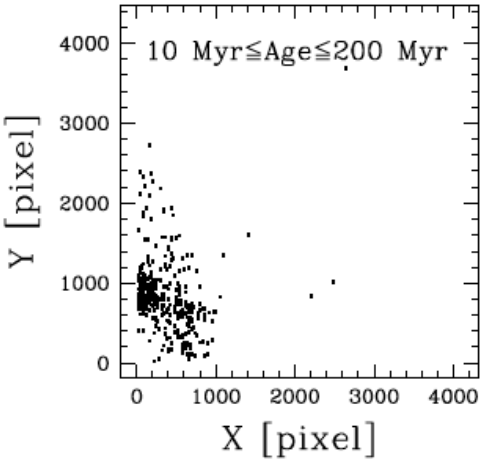
jected size of ∼20" × 80" in the LBT images, a total integrated magnitude of $m_r = 21.6 \pm 0.4$ mag, and an average color of $g - r = 0.56 \pm 0.11$, which translate,

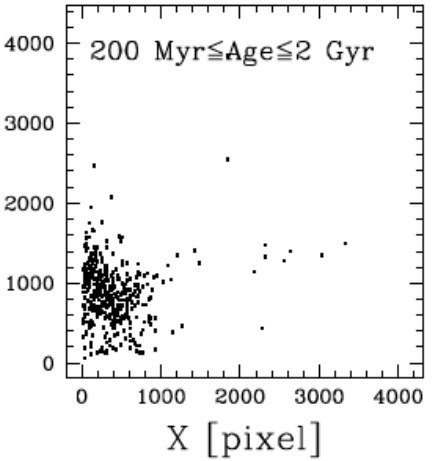


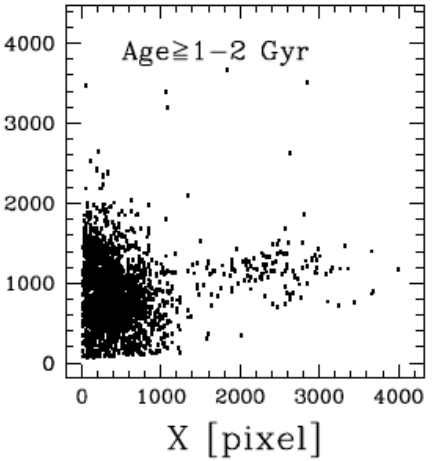






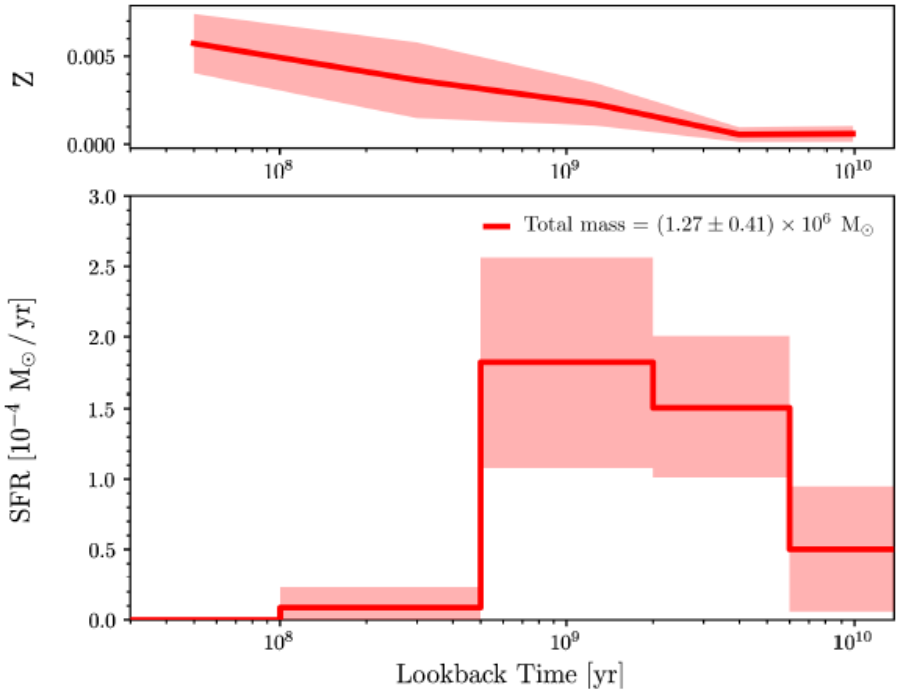


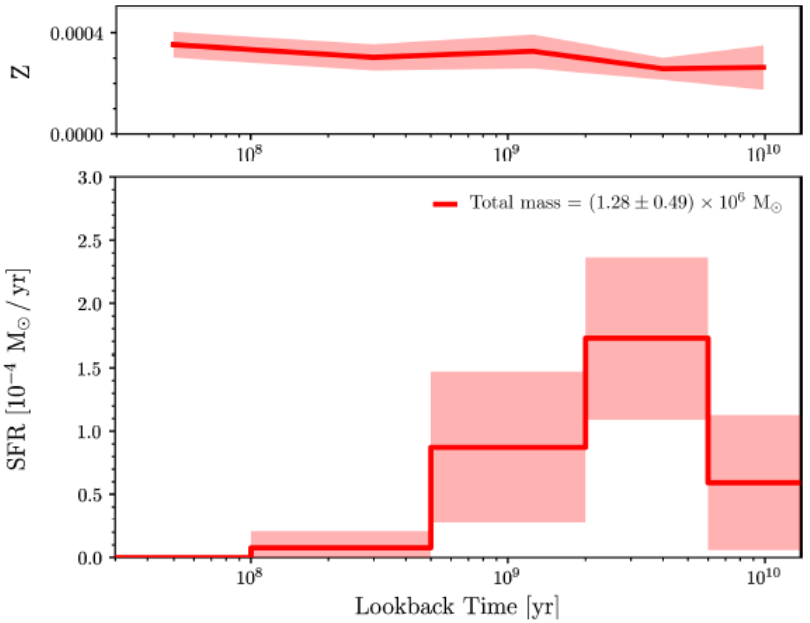




Distance (RGB tip)

S1: 12.8+/-0.7 Mpc => projected distance 6 kpc
DDO68~12.65 Mpc





Металличность Z=0.006 (40% Solar) заметно выше той, что в DDO68 HII-regions:

Concerning metallicity, the best-fit solution implies a continuous increase in Z starting from ∼0.0006 at the oldest look-back times and reaching up to Z∼0.006 (∼40% solar) at recent epochs. This value is significantly higher than the Z∼0.0004 (∼2%) solar metallicity measured in DDO 68's H II regions, and also much higher than expected for a $\sim 10^6 M_\odot$ stellar mass galaxy. Admittedly, given the strong age-metallicity degeneracy in the RGB phase combined with the relatively large photometric errors of our data, we can not claim a robust constraint on metallicity at epochs earlier than 1 Gyr ago. At more recent epochs, when the rate was compatible with zero, the metallicity is not well con-

DDO68 (main) есть звезды разных возрастов (1-10 Gyr)

S1 – преимущественно >1-2 Gyr, нет моложе 200 Myr, и газа нет

По массе – сравним с dSph (Draco, Ursa Minor), но сильнее размазан (re=2 kpc vs 0.2) и вытянут

Результат взаимодействия с DDO 68 (Annibali et al. 2016 – Nbody, merging 1:1/150)

Заодно еще и газ с него стянуло (если было, а было-то не очень много):

A possible scenario is that the SF in S1 was quenched some hundred Myrs ago through gas stripping by DDO 68.

А то, что в самом ВВЩ68 есть области низкой металличности – результат слияния с DDO68 B (merging 1:1/10)

И всё это радостно согласуется с LCDM иерархическим скучиванием, так как для такой системы как раз предсказали пару спутников

process. Dark-matter only simulations in a ΛCDM cosmology predict that substructures persist within haloes down to the resolution limit of the simulations (Diemand et al. 2008); hydrodynamical simulations including different sources of feedback (e.g. Wheeler et al. 2015, 2018) have then attempted to predict the fraction of sub-haloes that hosts in fact star formation. For instance, according to Dooley et al. (2017) we expect a $\sim 3 \times 10^8$ $M_\odot$ stellar mass galaxy (i.e., with mass not too far from that of DDO 68) to host 1−2 satellites with stellar masses above $10^5 M_\odot$. These predictions are in excellent agreement with the case of DDO 68, which is accreting a ten times smaller body (DDO 68 B) and another smaller $10^6 M_\odot$ stellar mass system (S1).