Are major mergers important?

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Are major mergers important?

- Do major mergers contribute significantly to cosmic star formation at z~2?

- Do major mergers create spheroids in the early Universe?

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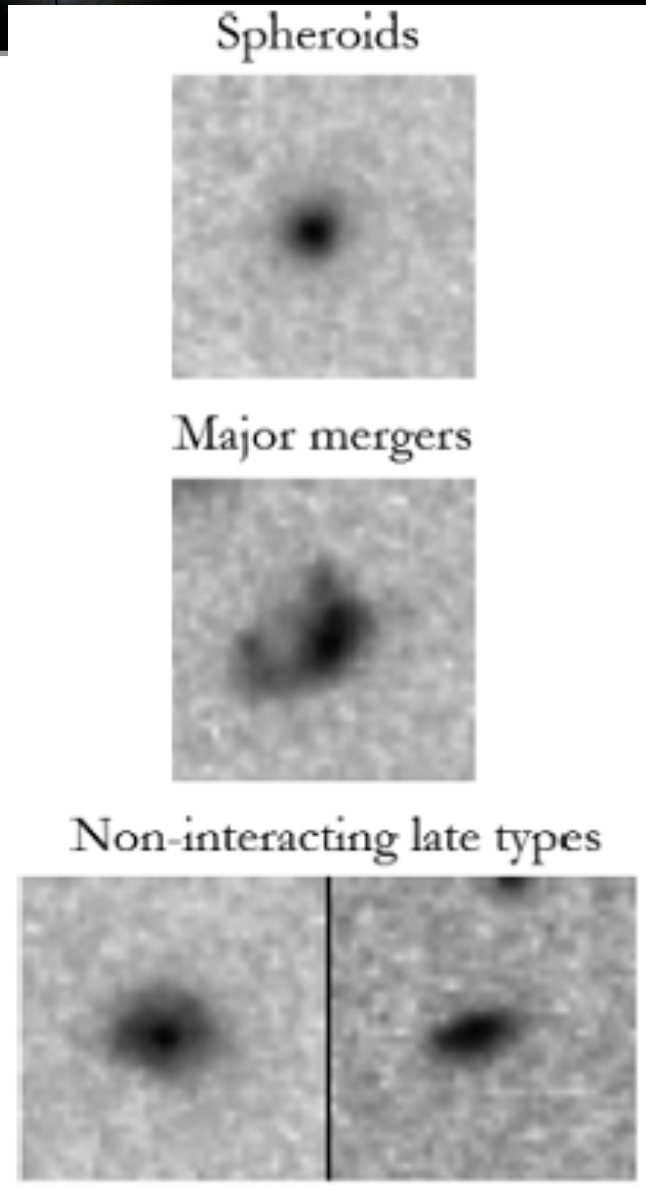
Are major mergers important drivers of SF?



- Many massive high-redshift star-formers are disks (e.g. Genzel+08, 11, Forster-Schreiber +06, Mancini+11)
- Desirable to quantify *proportion* of cosmic SF driven by major mergers
- WFC3 ERS: visually split ($M^*>10^{10}\,M_\odot$) sample into spheroids, late-types and major mergers

SK et al. 2013, MNRAS, 429, L40

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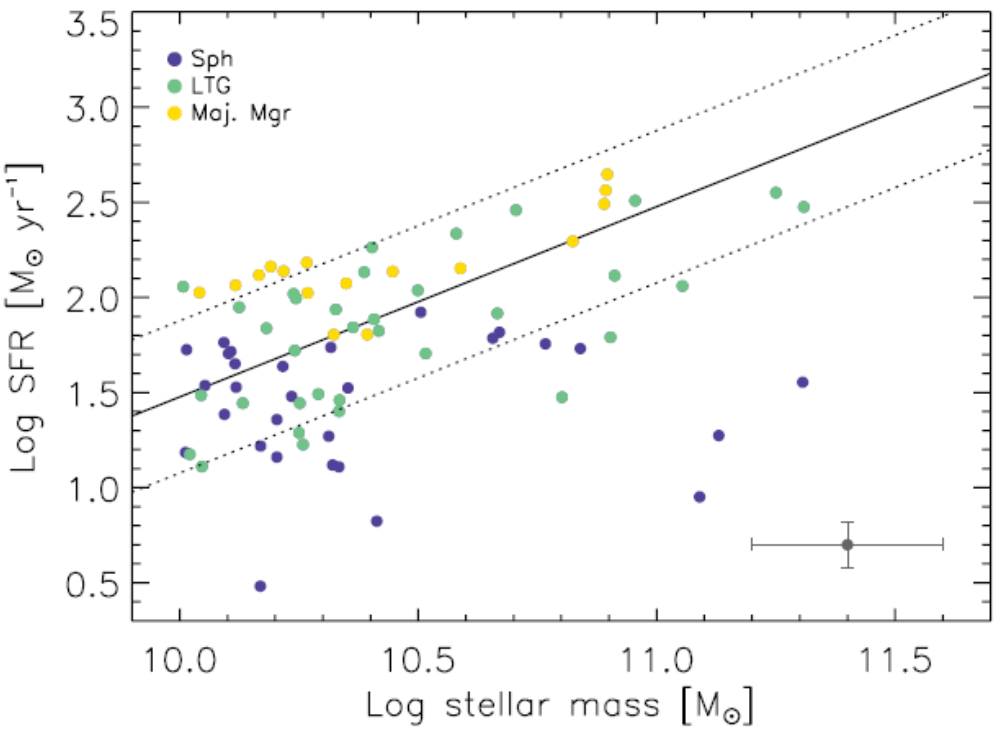
SF main sequence split by morphology at z~2



SK et al. 2013, MNRAS, 429, L40

- Estimate galaxy SFRs from SED fitting
- Recover SF main sequence (e.g. Daddi+05, Reddy+12)
- Major mergers and LTGs overlap in SFR-M* space

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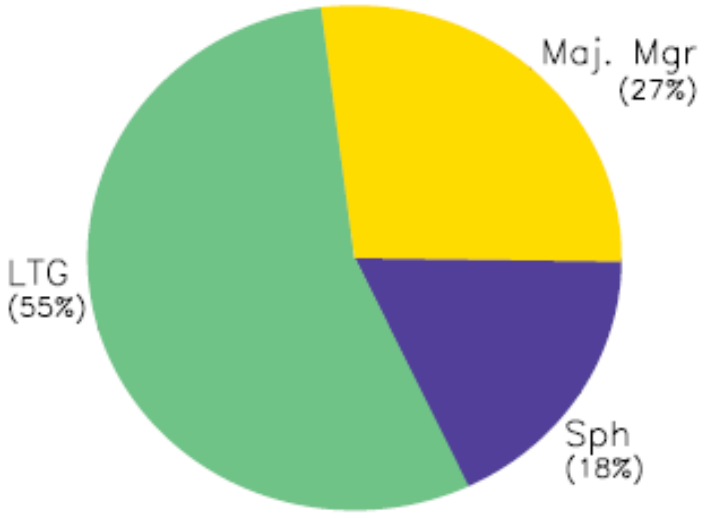
SF budget split by morphology at z~2

Morphology	Fraction of SF budget
Non-interacting late-types	$0.55^{\pm 0.14}$
Major merger	$0.27^{\pm 0.08}$
Spheroids	$0.18^{\pm 0.06}$



SK et al. 2013, MNRAS, 429, L40

- Major-merger contribution ~27%
- But background SF level already quite high at z~2 (e.g. Law+12, Di Matteo+07, Dekel+09)
- Subtract 'secular' SF - major merger contribution <15%
- **Overall contribution of major-mergers to cosmic SF at z~2 is small**

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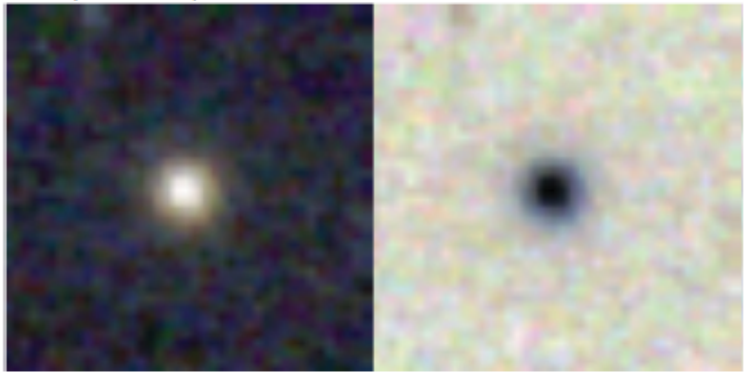
Do major mergers create spheroids?

Relaxed spheroids

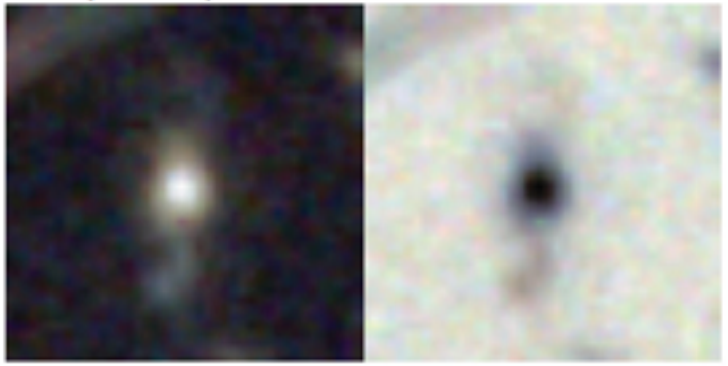
162 (z = 1.54)

848 (z = 2.17)

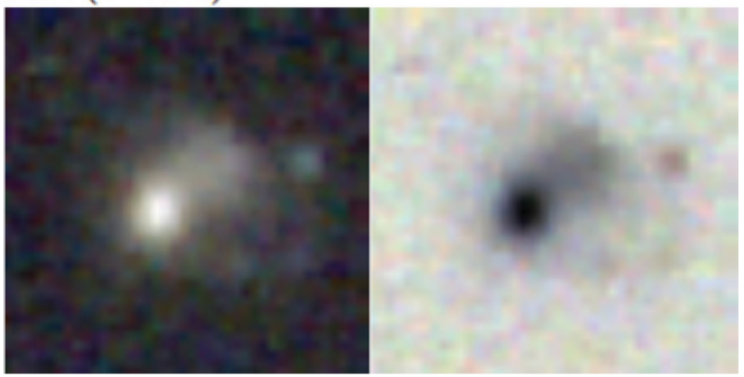


Disturbed spheroids

1296 (z = 1.65)



3434 (z = 1.81)



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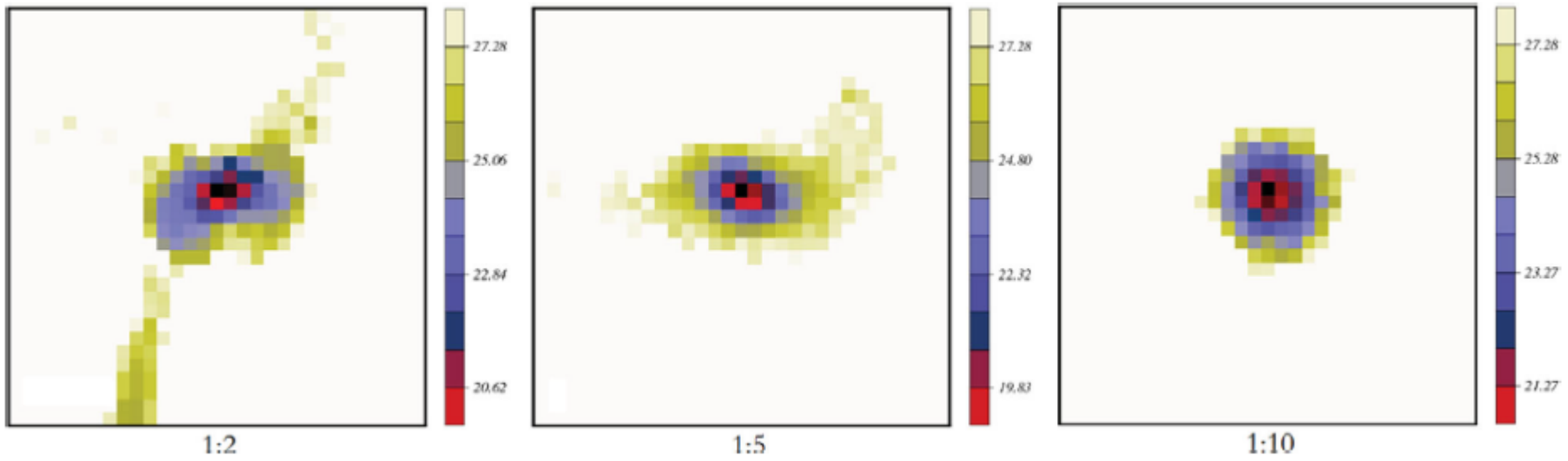
Do major mergers create spheroids?



- Only major mergers (mass ratios <1:3) are visible in ERS images
- Lack of tidal features around a *blue* spheroid indicates that it did *not* experience a recent major merger

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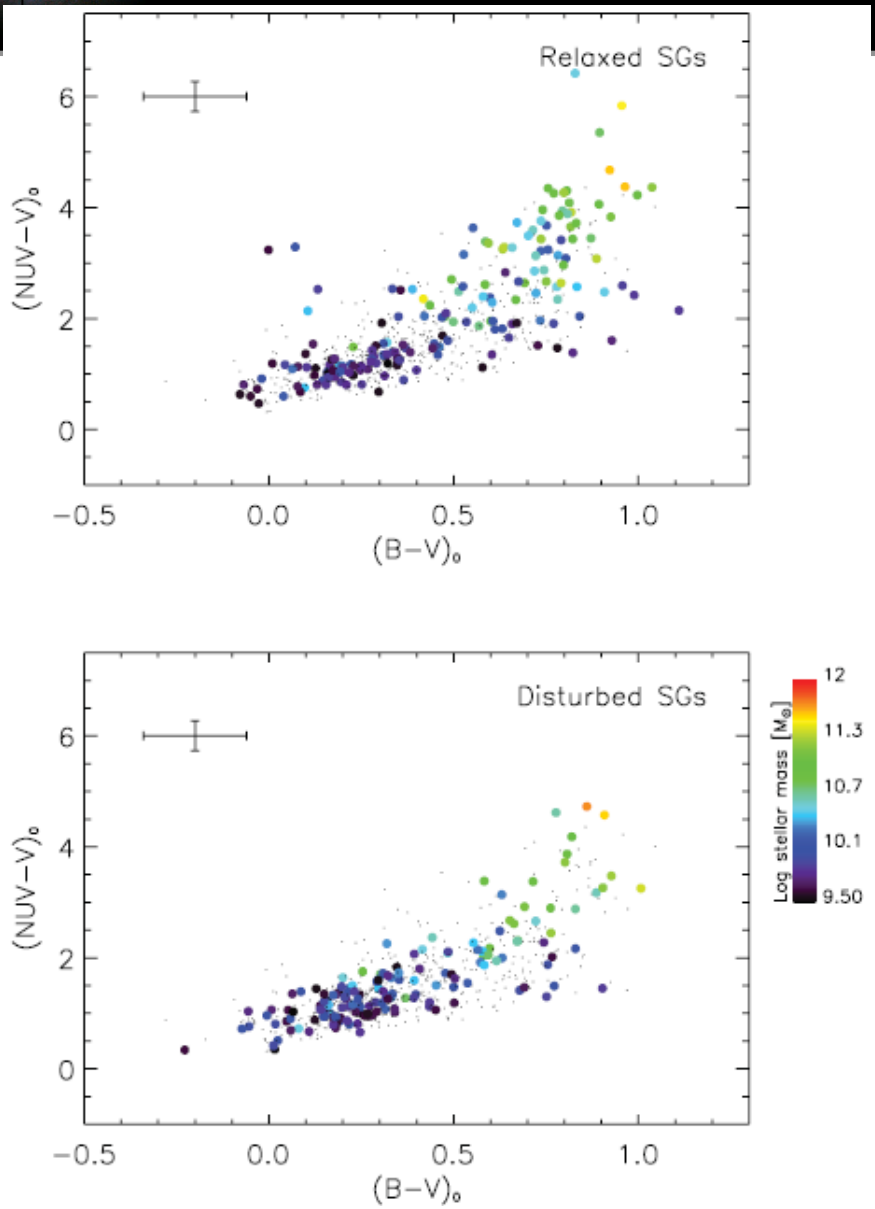
Lack of tidal features in newborn spheroids



- At least 50% of blue spheroids show no tidal features indicative of major mergers
- Are *at least* some spheroids forming directly via violent disk instability (e.g. Dekel+09)?

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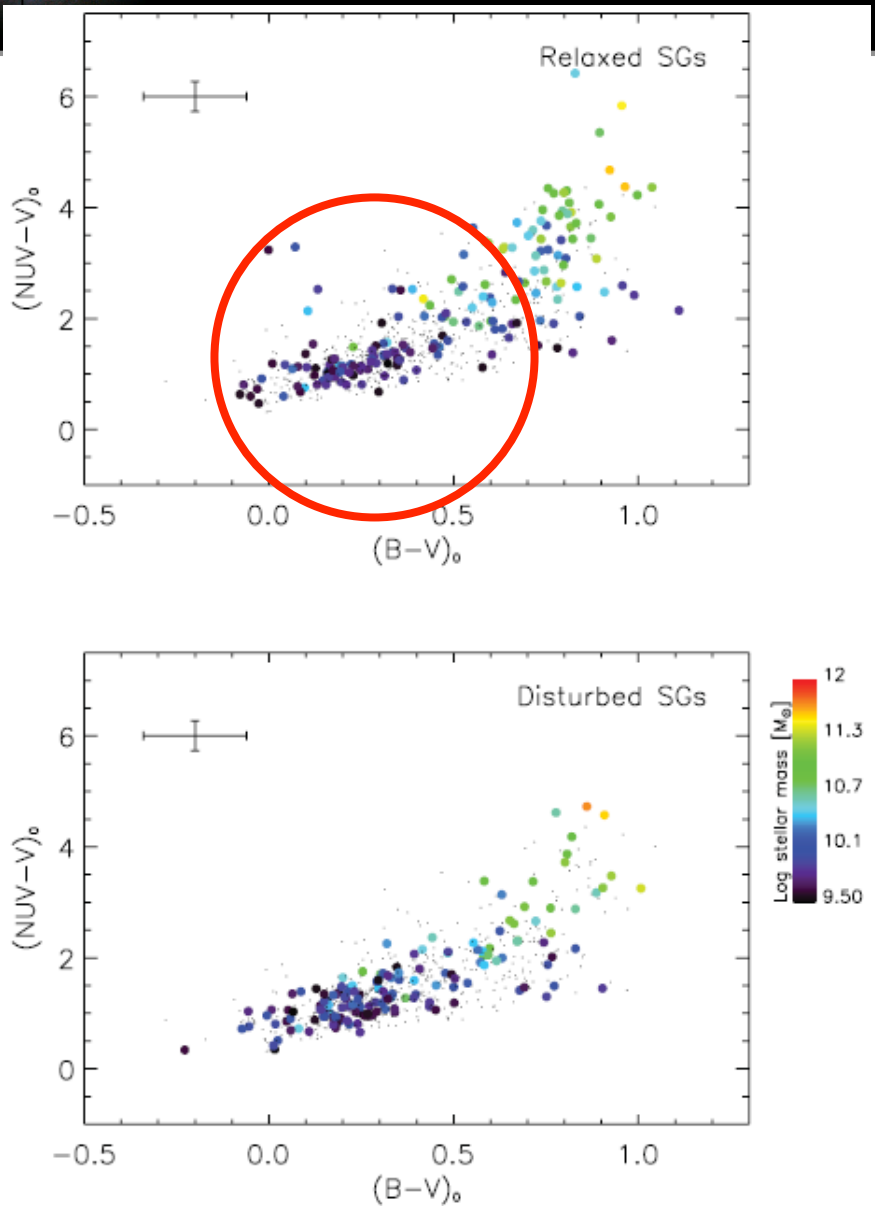
Lack of tidal features in newborn spheroids



- At least 50% of blue spheroids show no tidal features indicative of major mergers
- Are *at least* some spheroids forming directly via violent disk instability (e.g. Dekel+09)?

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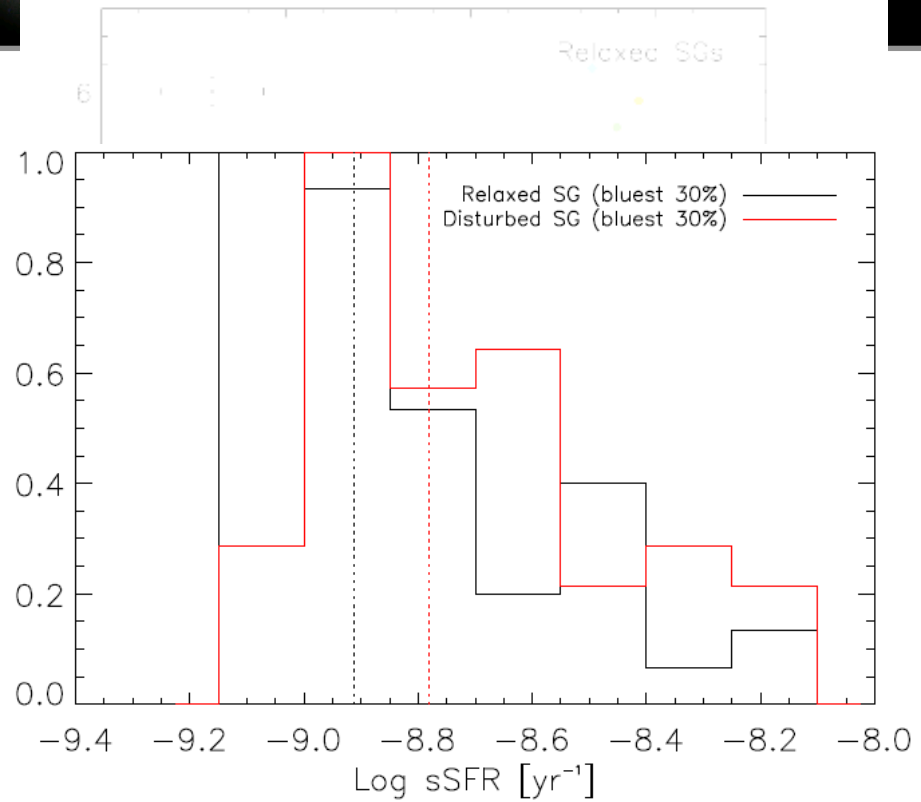
Mild SF enhancement in major merger remnants



SK et al. 2013, MNRAS, 428, 925

- At least 50% of blue spheroids show no tidal features indicative of major mergers
- Are *at least* some spheroids forming directly via violent disk instability (e.g. Dekel+09)
- SSFR enhancement in disturbed spheroids is modest (consistent with morphological analysis)
- **Major mergers unlikely to be creating a large fraction of spheroids at 1<z<3**

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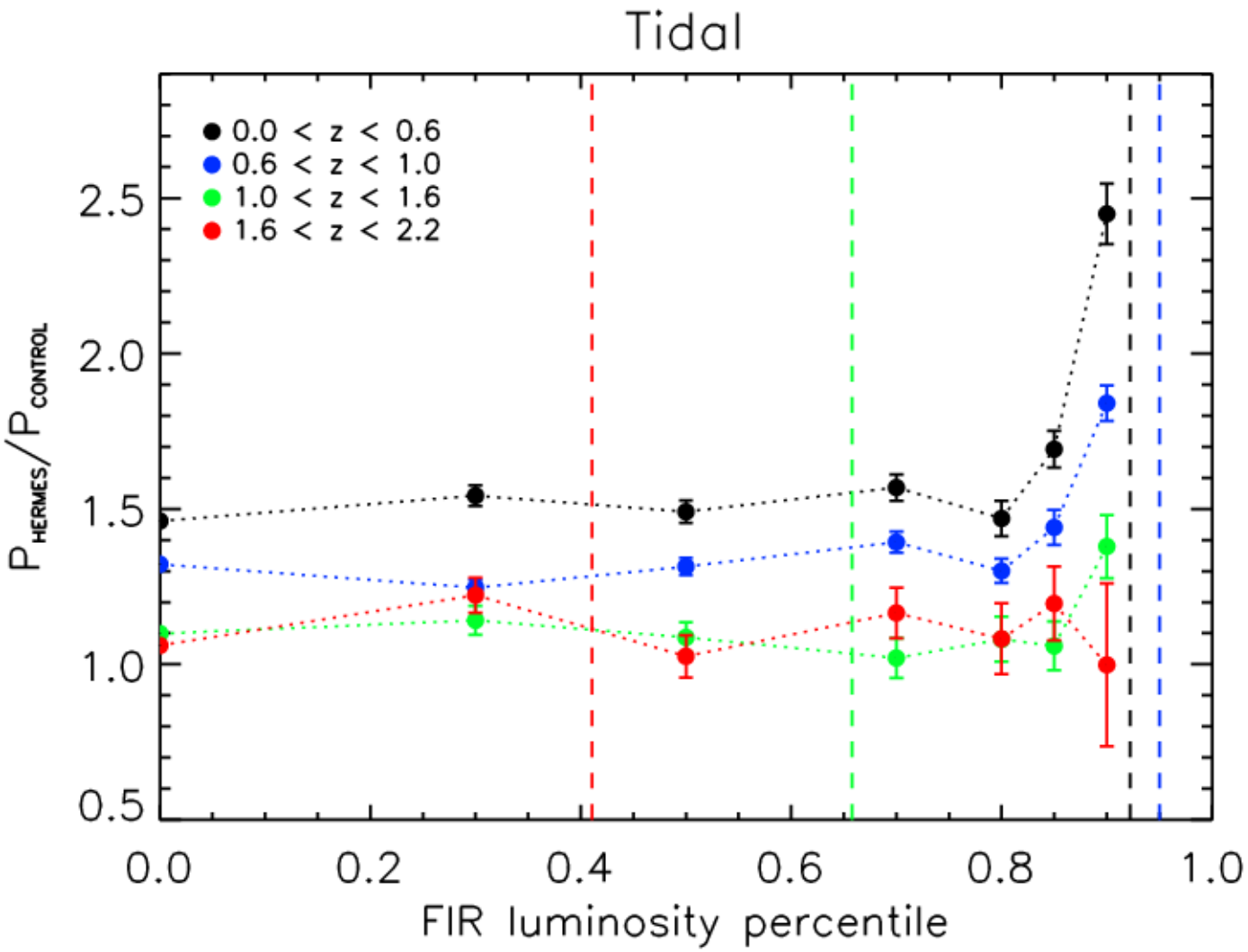
The role of merging over cosmic time

GZ + CANDELS + HerMES + PEP



Are (major) mergers important?

- Do major mergers contribute significantly to SF budget at z~2?

  Major merger contribution <15% **(SK et al. 2013, MNRAS, 429, L40)**

- Do major mergers create early spheroids?

  50%+ of blue spheroids at z~1.5 have not experienced a recent major merger **(SK et al. 2013, MNRAS, 428, 925)**

- Role of merging in driving strong star formation diminishes quickly after z~1

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The role of merging over cosmic time