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Maximum likelihood inference of growth rate with SNIa velocity and galaxy density fields

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Using supernovae of type Ia for inferring the growth rate of structure (fσ8) has seen a significant gain in interest in recent years. In particular, maximizing the potential of fσ8 constraints can be achieved by coupling peculiar velocity estimators with the underlying density field. I will present a recent software called flip (Ravoux et al. in prep.(a), https://github.com/corentinravoux/flip), allowing to perform this measurement with a maximum likelihood inference method. The mathematical framework on which flip is based allows the reproduction of all the previous models of field-level covariance for velocities and densities in an algorithmically optimized way with Hankel transforms. Furthermore, the flip software contains improvements such as the simultaneous inference of all nuisance parameters (including velocity estimators), accounting for redshift dependence, and extending field-level covariance models. An earlier software version was used to prove the feasibility of measuring fσ8 on ZTF simulations (Carreres et al. 2023). Currently, flip is being tested to measure fσ8 with Pantheon+ data, in LSST simulations (Rosselli et al. in prep., Carrerres et al. in prep.), and on simulations coupling ZTF SNIa with DESI galaxy field (Ravoux et al.(b) in prep.). I will give a general presentation of the flip software, its core concepts, and the results associated with the previously mentioned studies.

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