

# Controlling the False Discovery Rate (FDR)

A summary of how you can control the False Discovery Rate:  $FDR = E(V/R | R > 0) P(R > 0)$  after Benjamini and Hochberg (1995) when multiple hypothesis testing is performed, e.g. a statistical test is applied on every grid box of a model grid. The procedure can be applied to every collection of tests that are performed to local grid points, e.g. correlation, t-test, and so on, as long as p-values are provided.

An overview of the problem and practical solutions on how to implement the FDR procedure into your software (R, Matlab, python) can be found in this [presentation](#) (Oliver Gutjahr - Ocean group meeting on 13 Nov 2019).

xarray implementation (Aaron Spring):

```
def xr_multipletest(p, alpha=0.05, method='fdr_bh', **multipletests_kwargs):
    """Apply statsmodels.stats.multitest.multipletests for multi-dimensional
    xr.objects."""
    from statsmodels.stats.multitest import multipletests
    # stack all to 1d array
    p_stacked = p.stack(s=p.dims)
    # mask only where not nan:
    https://github.com/statsmodels/statsmodels/issues/2899
    mask = np.isfinite(p_stacked)
    pvals_corrected = np.full(p_stacked.shape, np.nan)
    reject = np.full(p_stacked.shape, np.nan)
    # apply test where mask
    reject[mask] = multipletests(
        p_stacked[mask], alpha=alpha, method=method,
        **multipletests_kwargs)[0]
    pvals_corrected[mask] = multipletests(
        p_stacked[mask], alpha=alpha, method=method,
        **multipletests_kwargs)[1]

    def unstack(reject, p_stacked):
        """Exchange values from p_stacked with reject (1d array) and
        unstack."""
        xreject = p_stacked.copy()
        xreject.values = reject
        xreject = xreject.unstack()
        return xreject

    reject = unstack(reject, p_stacked)
    pvals_corrected = unstack(pvals_corrected, p_stacked)
    return reject, pvals_corrected

reject, xpvals_corrected = xr_multipletest(p)
```

Last  
update: analysis:pot\_pourri:statistics:controlling\_fdr [https://wiki.mpimet.mpg.de/doku.php?id=analysis:pot\\_pourri:statistics:controlling\\_fdr](https://wiki.mpimet.mpg.de/doku.php?id=analysis:pot_pourri:statistics:controlling_fdr)  
2020/09/22 17:43

---

From:  
<https://wiki.mpimet.mpg.de/> - MPI Wiki

Permanent link:  
[https://wiki.mpimet.mpg.de/doku.php?id=analysis:pot\\_pourri:statistics:controlling\\_fdr](https://wiki.mpimet.mpg.de/doku.php?id=analysis:pot_pourri:statistics:controlling_fdr)

Last update: **2020/09/22 17:43**

