Gapfilling

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Motivation

The filtering for low u_* introduced gaps in the NEE data. In order to compute annual sums, these must be filled with estimated fluxes.

Lookup tables (LUT)

Fluxes are expected similar if they are

- at similar environmental conditions
  - Rg $\pm$ 50 Wm^{-2}, Tair $\pm$ 2.5 °C, and VPD $\pm$ 5.0 hPa
- and close in time
  - increasing time window until enough observations

Such LUT windows are used to compute

- mean (NEE_<uStar>_f) and
- and standard deviation (NEE_<uStar>_fsd).

The variation in fluxes is assumed to represent random error.

Mean diurnal course (MDC)

Fluxes are expected similar if they are

- at the same time of the day (± 1 hour)
- not too many days away

Marginal distribution sampling

Combines LUT and MDC

Quality flag increases with fewer variables and larger time windows

- 0 Observations
- 1 gap-filled with good quality
- > 1 gap-filled with lower quality

Perform the gapfilling

One needs to specify the variable, i.e. column which should be filled.

```
EProc$useAnnualUStarThresholds() # use annual u* threshold estimates
EProc$sMDSGapFillUStarScens('NEE')
```

The screen output (not shown here) already shows that the u_*-filtering and gap-filling was repeated for each given estimate of the u_* threshold , i.e. column in `uStarThAnnual`, with marking 22% to 38% of the data as gap.

Inspect the outputs

For each of the different u_* threshold estimates a separate set of output columns of filled NEE and its uncertainty is generated, distinguished by the suffixes given with `uStarSuffixes`. "_f" denotes the filled value and "_fsd" the estimated standard deviation of its uncertainty.

```
grep("NEE_.*_f$",names(EProc$sExportResults()), value = TRUE)
grep("NEE_.*_fsd$",names(EProc$sExportResults()), value = TRUE)
```

```
## [1] "NEE_uStar_f" "NEE_U05_f"   "NEE_U50_f"   "NEE_U95_f"
## [1] "NEE_uStar_fsd" "NEE_U05_fsd"   "NEE_U50_fsd"   "NEE_U95_fsd"
```

Inspect the outputs

A fingerprint-plot of one of the new variables shows that gaps have been filled.

```
EProc$sPlotFingerprintY('NEE_U50_f', Year = 1998)
```