STRESS TESTING . . .

Natural variability (ST_{NAT})

End — **Stress test** backward-orientated — Start (*31 May*) | *1 Jun* — **Recovery** from stress test

Pre-drought — Drought — *Time*

Use corresponding P-and T-data for stress test simulation (HBV)

1999, 2000, 2001, YYYY, 2003

year-4, year-3, year-2, YYYY, drought year

Evaluate changes in streamflow metrics during recovery (e.g. deficit, duration, magnitude)

Permute pre-drought year with all years from data series

1971, 1972, 1973, 1974, ..., 2012, 2013, 2014, 2015

Stress test response

Reference Q — Stress test Q

HBV model framework

For each drought year

- ✓ Fixed start date
- ✓ Fixed stress test length
- ✓ Use all data years

1976, 1985, 1991, 2003, 2011, 2015

6 drought years

- ✓ Variable stress test length
- ✓ Event-specific start date
- ✓ Use worst-case period

For each drought year

Evaluate changes in streamflow metrics during recovery (e.g. deficit, duration, magnitude)

Use corresponding P-and T-data to set up stress test simulation (HBV)

Worst-case (ST_{WORST})

Weighting function to prefer periods with less recharge at stress test start

10 specific worst-case periods with minium recharge (50 %) and snowpack (50 %) from data (1971–2015)

Duration in days: 30, 60, 90, 120, 150, 180, 270, 360, 720, 1080

Stress test start

Identify last Q_{50} before AM_7 as stress test start

Daily Q_{50}

Start minimum flow of low flow event in drought year

Daily Q_{50}

Long-term Q_{85}

AM_7

Minimum flow (Jun-Nov)

Pre-drought — Drought — *Time*

Stress test backward-orientated: End — Start

Recovery from stress test

. . . DROUGHT SENSITIVITY

- *Which drought years are amplified due to stress testing and which not? (benchmark droughts)*
- *Is the catchment sensitive to 12-months pre-drought recharge change or not?*
- *Which stress test duration leads to most severe response during drought?*
- *Which response patterns in terms of changes in deficit, duration, magnitude are emerging?*