# Predicting litterfall production for Scots pine stands using stand, site and climate factors

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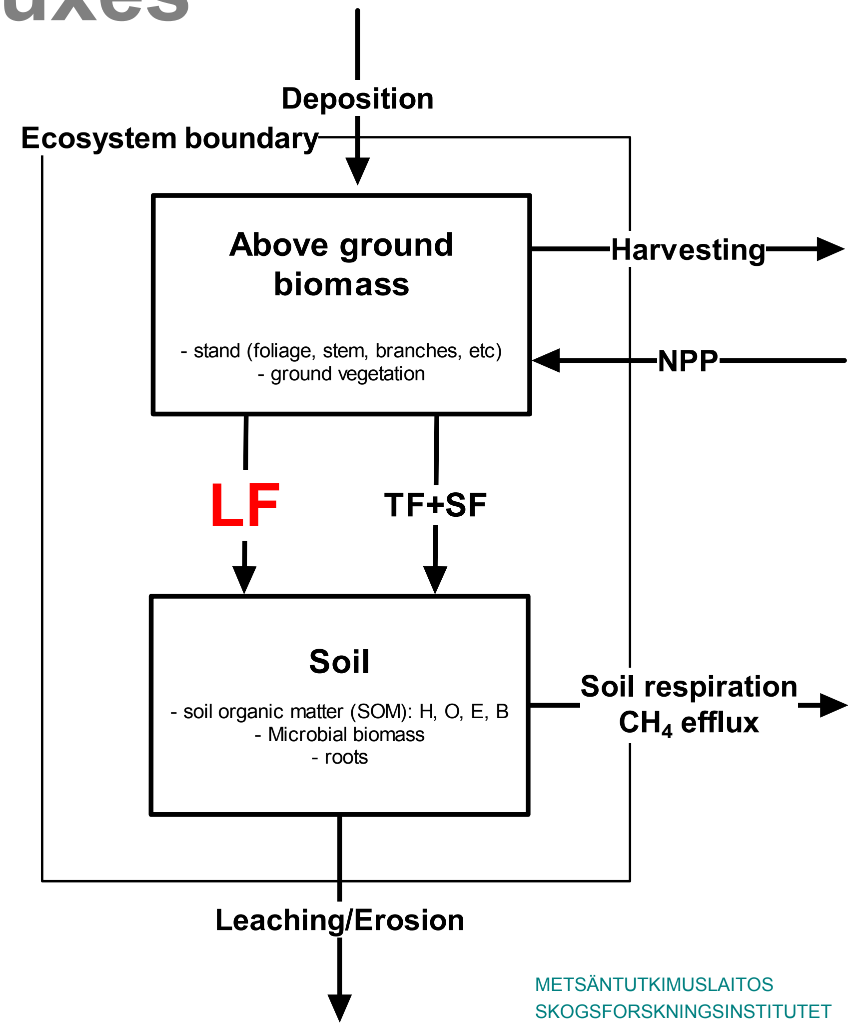
# Carbon pools and fluxes

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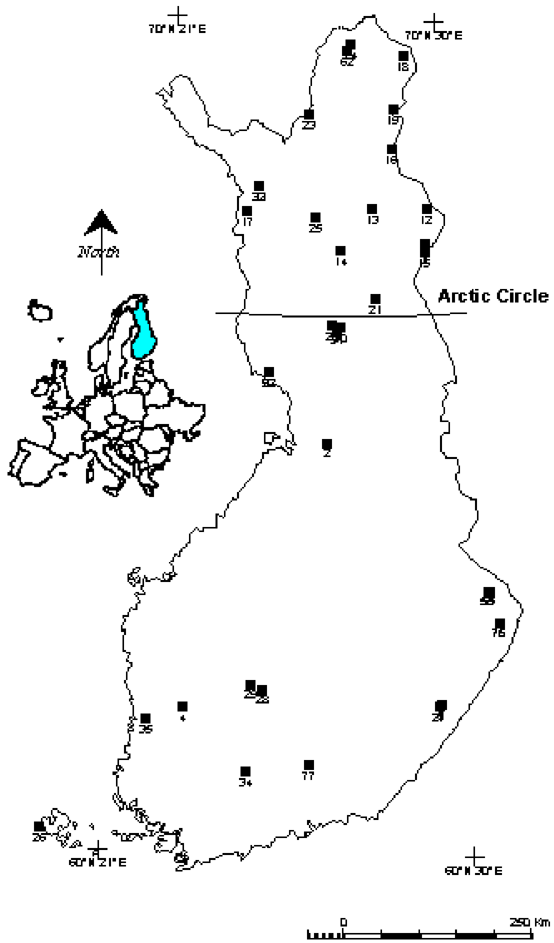
# Above-ground needle & total annual litterfall data for 34 pine Scots pine stands

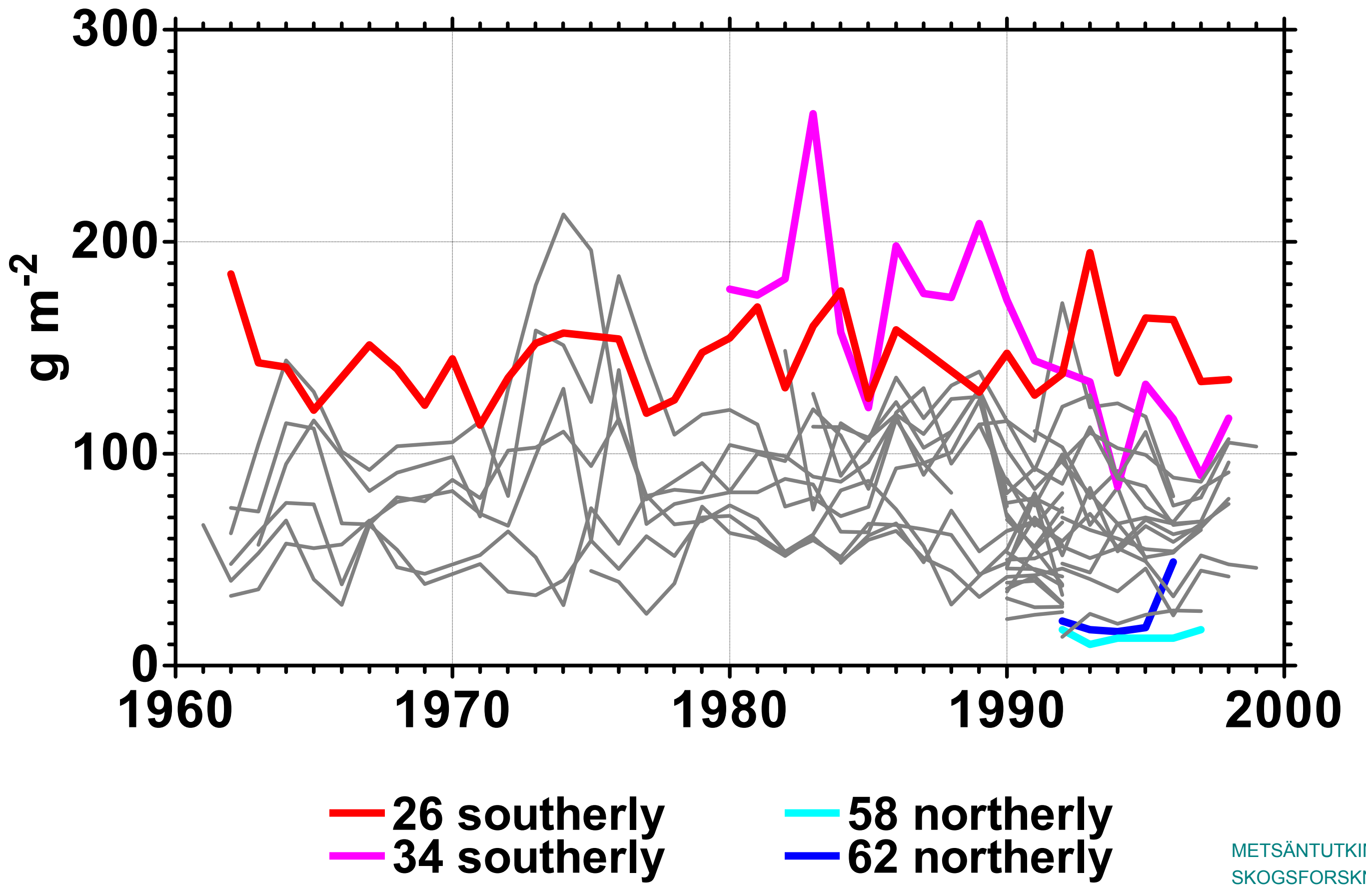
- data from 5 projects collected for different purposes (phenology *vs* nutrient cycling)
- differing collection intervals (bi-, monthly to several months)
- differing number of collectors (6-12) and arrangement (random, systematic)
- differing collection periods (3-37 years)

# Location and description of the 34 stands




- age: 35 to > 200 yrs
- basal area: 6 to 30 $m^2$ $ha^{-1}$
- stem volume: 46 to 315 $m^3$ $ha^{-1}$
- mean needle LF: 22 to 157 g $m^{-2}$ $yr^{-1}$
- mean total LF: 32 to 230 g $m^{-2}$ $yr^{-1}$

# Variation in needle annual litterfall production



# Dataset used for development of regression models

For each stand:

- data for 3 consecutive years in 1990s used (year of latest stand measurements, +1, and +2)
- Climatic data (monthly temperature, temperature sum, precipitation) generated for each stand and year using ILMA (Ojansuu & Henttonen 1983)

# Correlation between litterfall and location factors

| Variable | $LF_{needle}$ (n=102) | $LF_{total}$ (n=96) |
|---|---|---|
| latitude | -0.799 | -0.751 |
| longitude | (-0.159) | -0.242 |
| elevation | -0.525 | -0.561 |

# Correlation between litterfall and stand factors

| Variable | $LF_{needle}$ (n=102) | $LF_{total}$ (n=96) |
|---|---|---|
| site type | 0.390 | 0.424 |
| age | -0.294 | (-0.157) |
| stem no. | 0.253 | (0.190) |
| basal area | 0.659 | 0.728 |
| dbh | 0.316 | 0.466 |
| height | 0.474 | 0.633 |
| stem volume | 0.610 | 0.732 |

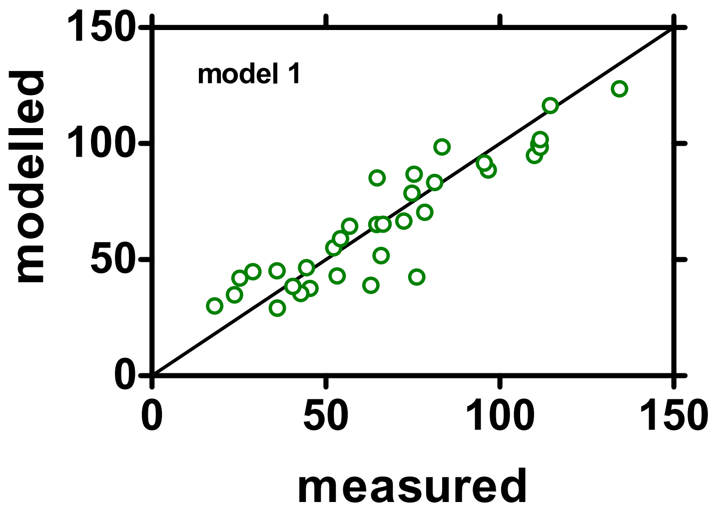
# Correlation between litterfall and climate factors

| Variable | $LF_{needle}$ (n=102) | $LF_{total}$ (n=96) |
|---|---|---|
| ETS | 0.718 | 0.703 |
| $ETS_{-1}$ | 0.740 | 0.711 |
| $T_{Jul}$ | 0.686 | 0.650 |
| $T_{Jul-1}$ | 0.744 | 0.740 |
| P | 0.255 | 0.338 |
| $P_{-1}$ | 0.507 | 0.484 |
| $ET_{Index}$ | -0.500 | -0.460 |
| $ET_{Index-1}$ | -0.489 | -0.474 |

# Needle litterfall models

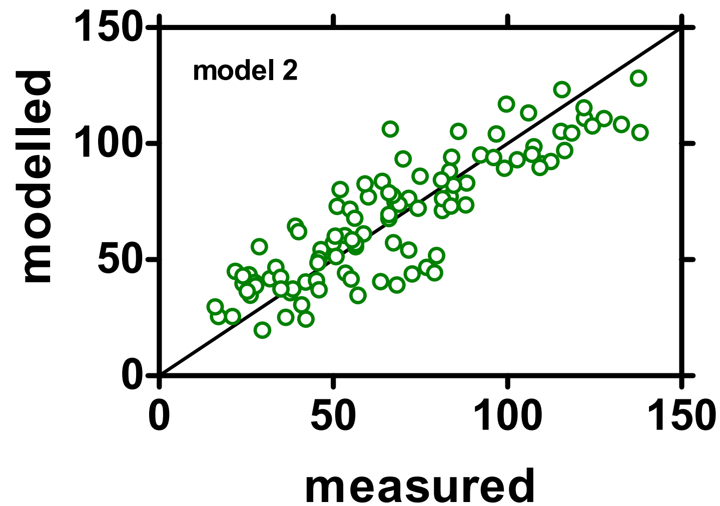
## latitude

$LF_{needle}$=512.892-6.96lat+2.223ba-1.558h
($n$=34; $R^2$=82%; SEest=12.6)




## climate

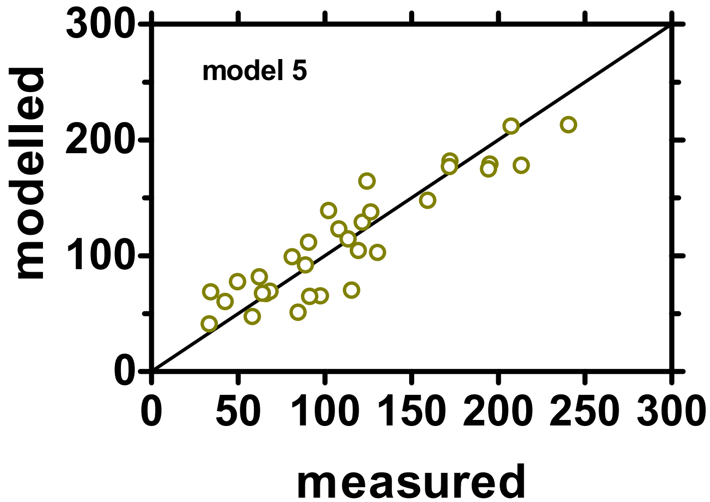
$LF_{needle}$=-10.07+2.01ba+0.011stems+0.058$ETS_{-1}$-1.822$ET_{index}$
($n$=102; $R^2$=75%; SEest=15.6)



# Total litterfall models

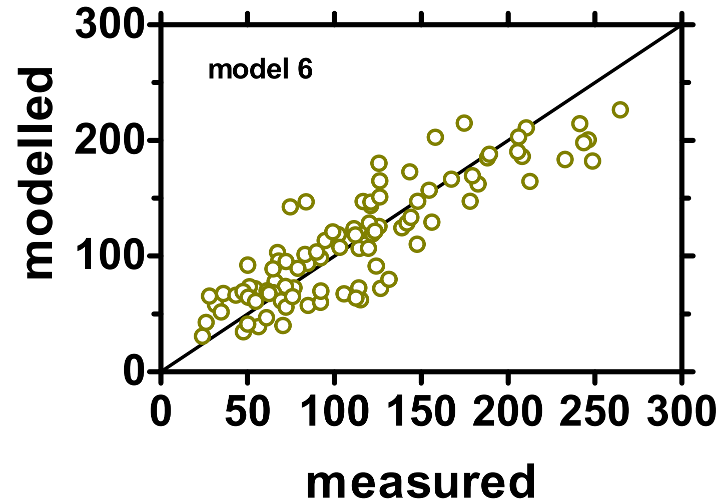
## latitude

$LF_{total}$=715.99-10.205lat+4.193ba
(n=32; $R^2$=82%; SEest=23.3)




## climate

$LF_{total}$=-71.241+4.401ba+0.049ETS+0.078$ETS_{-1}$
(n=96; $R^2$=76%; SEest=28.3)

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# Conclusion

**Using generally available site, stand and climate data it is possible to predict site specific, actual annual litterfall production with considerable accuracy and precision**

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