Supplementary material of

**Benchmarking the retrieval of biomass in boreal forest using P-band SAR backscatter with multi-temporal C- and L-band observations**

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Petersson’s functions [37] for estimating stem biomass, $B_s$, and branch biomass, $B_b$ [t/ha]:

Variables:
- $D$ - diameter at breast height including bark in mm
- $A$ - tree age measured at breast height in years
- $G$ - five years radial growth measured at breast height in 0.1 mm
- $SI_s$ - site quality index if tree species is spruce in m
- $SI_p$ - site quality index if tree species is pine in m
- $N$ - northing coordinate in Swedish datum RT90 in 0.001°

### Branch biomass

For pine:

$$\ln(B_b) = -2.53322 + 1.989129 \ln(D) + 0.387203 \ln(G) + 0.105315 \ln(A) \quad (S1)$$

For spruce:

$$\ln(B_b) = -0.718621 + 1.74081 \ln(D) + 0.348379 \ln(G) + 0.180503 \ln(A) \quad (S2)$$

For birch:

$$\ln(B_b) = -2.782537 + 2.276815 \ln(D) + 0.228528 \ln(G) \quad (S3)$$

### Stem biomass

For pine in case site quality is determined by spruce:

$$\ln(B_s) = -7.674621 + 3.155671 \ln(D+25) - 0.002197 D + 0.084427 \ln(G) - 0.002665 G + 0.253227 \ln(A) + 0.028478 SI_s + 0.000008342 N \quad (S4)$$

For pine in case site quality is determined by pine:

$$\ln(B_s) = -7.674621 + 3.155671 \ln(D+25) - 0.002197 D + 0.084427 \ln(G) - 0.002665 G + 0.253227 \ln(A) + 0.031435 SI_p + 0.000008342 N \quad (S5)$$

For spruce in case site quality is determined by spruce:

$$\ln(B_s) = -6.839310 + 3.578450 \ln(D+25) - 0.003042 D + 0.093033 \ln(G) - 0.002763 G + 0.111347 \ln(A) + 0.012148 SI_s + 0.000020194 N \quad (S6)$$

For spruce in case site quality is determined by pine:

$$\ln(B_s) = -6.839310 + 3.578450 \ln(D+25) - 0.003042 D + 0.093033 \ln(G) - 0.002763 G + 0.111347 \ln(A) + 0.011586 SI_p + 0.000020194 N \quad (S7)$$
For birch in case site quality is determined by spruce:

$$\ln(B_s) = -3.091932 + 2.479648 \ln(D+7) + 0.243747 \ln(A) + 0.022185 \ SI_s$$  \hspace{1cm} (S8)

For birch in case site quality is determined by pine:

$$\ln(B_s) = -3.091932 + 2.479648 \ln(D+7) + 0.243747 \ln(A) + 0.022955 \ SI_p$$  \hspace{1cm} (S9)