Forest tree nutrition and soil chemistry development on the Intensive monitoring plots in the Czech Republic

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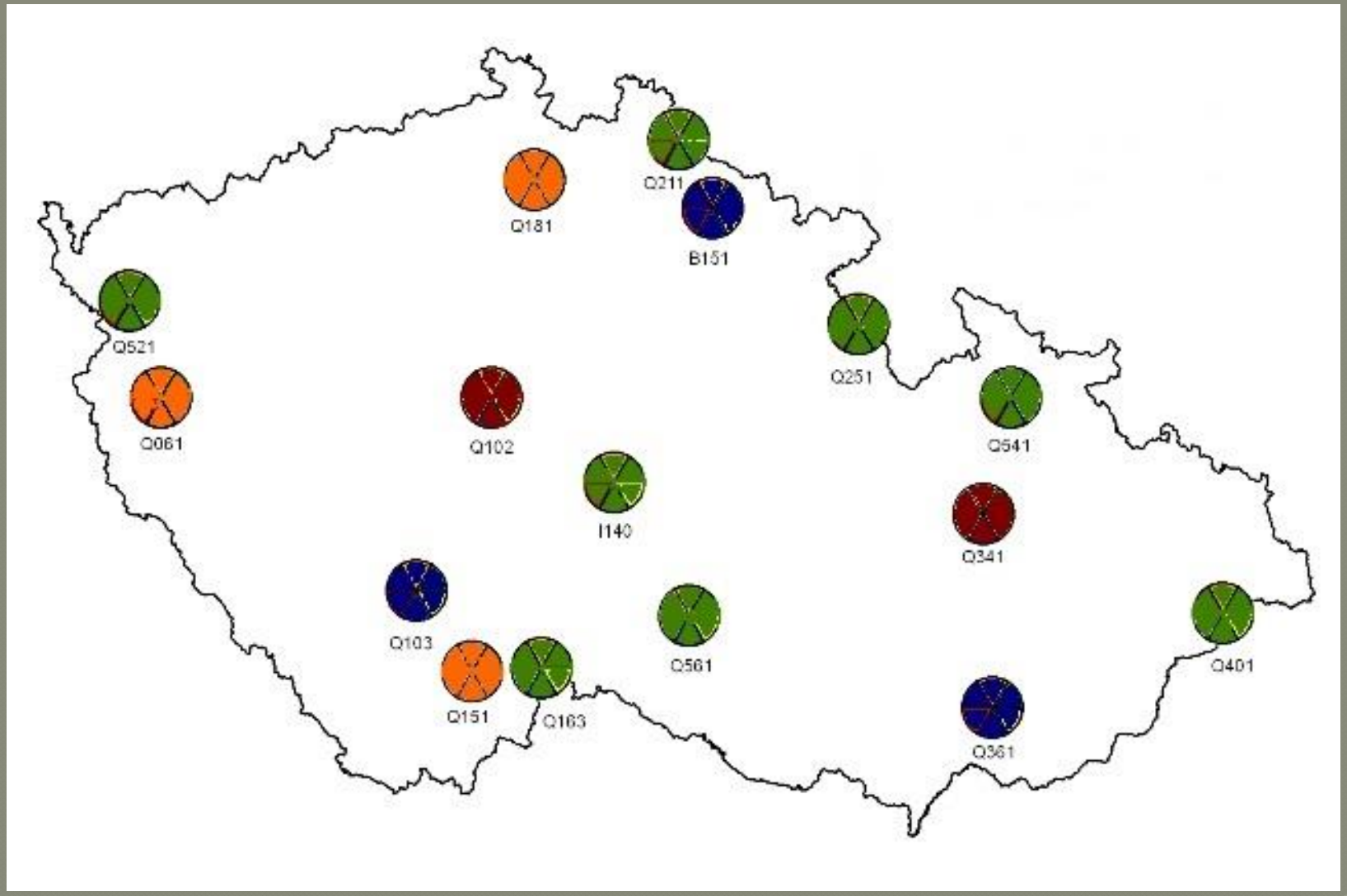
Intensive monitoring (Level II) plots in the Czech republic

- Has been carrying out since nineties
  - 1994 – 8 Norway spruce plots
- Last big changes ten years ago
  - 2003 – 16 plots according to the main tree species composition
  - 8 x Norway spruce
  - 3 x European beech
  - 3 x Scotch pine
  - 2 x Oak

Intensive monitoring (Level II) plots in the Czech republic

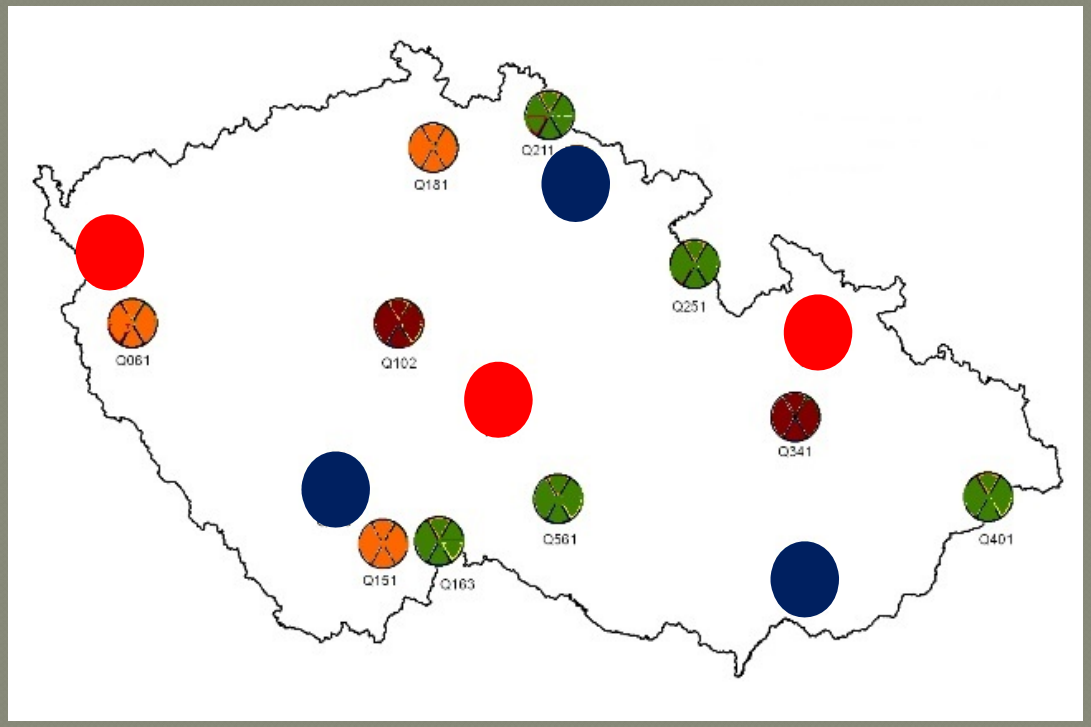


Provided surveys

- Soil survey
  - Every five years (i. e. 1995, 2000, 2005, 2010)
  - Soil pits
  - Exchangeable and total amount of elements
- Tree nutrition
  - Every second year (since 1995, resp. 2001)
  - Nutrients, trace elements, heavy metals
- Deposition load
  - Continuously at some of plots
  - Bulk, throughfall, stemflow

Soil chemistry development

- 3 x Norway spruce plot
- 3 x European beech plot
- low – mid – higher elevation

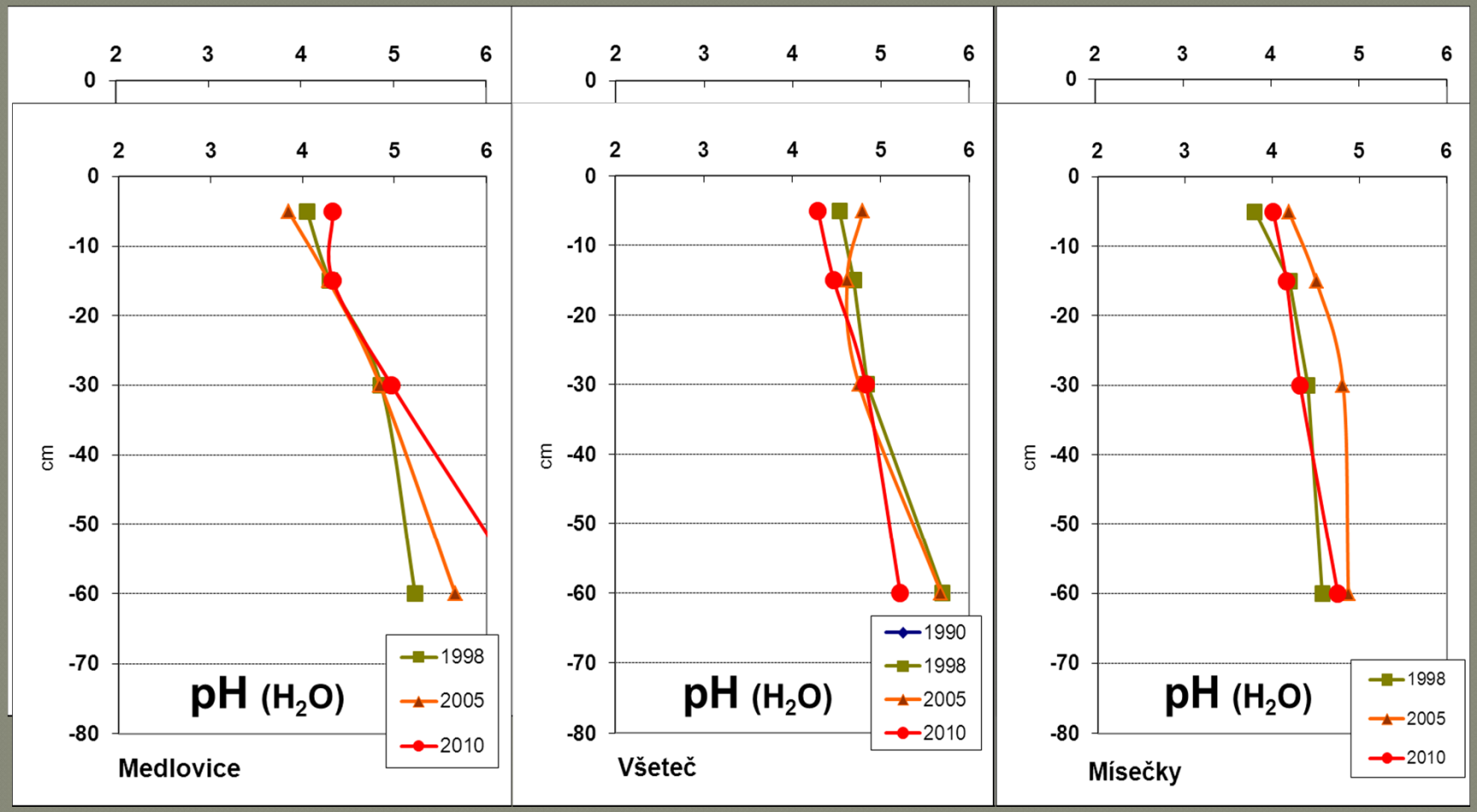


Plot	Elevation
I140 Spruce	440
Q521 Spruce	875
Q541 Spruce	1300
Q361 Beech	350
Q103 Beech	615
B151 Beech	940

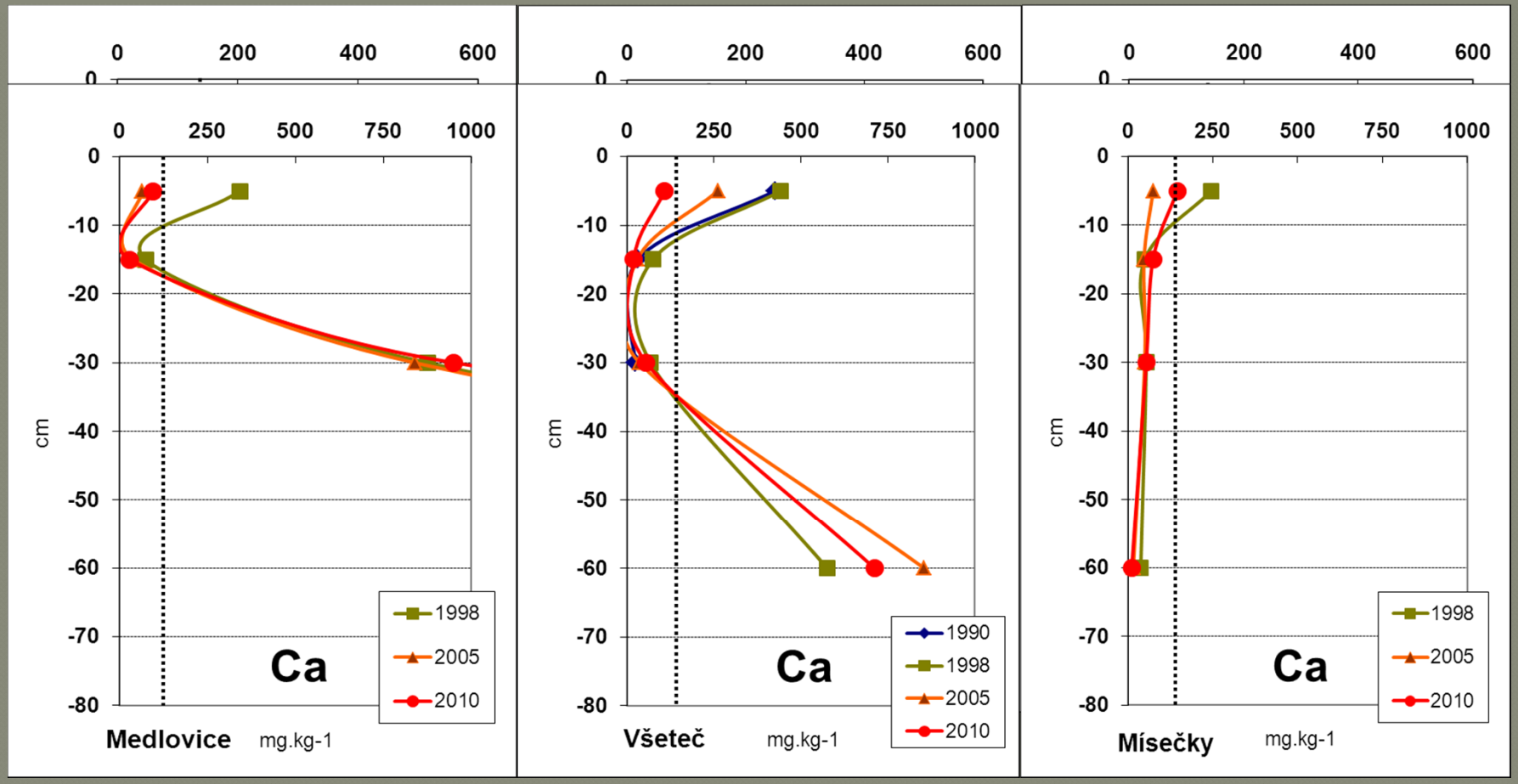
Soil chemistry development

Plot number	Main species	Elevation	Parent material	FAO soil unit
I140	Spruce	440	Paragneiss	Entri-Stagnic Cambisols
Q521	Spruce	875	Biotitic granite	Dystric Cambisols
Q541	Spruce	1300	Gneiss	Haplic podzols
Q361	Beech	350	Claystone to sandstone rocks	Endoeutri-Stagnic Cambisols
Q103	Beech	615	Biotitic paragneiss	Epidystric Cambisols
B151	Beech	940	Biotitic slate	Haplic podzols

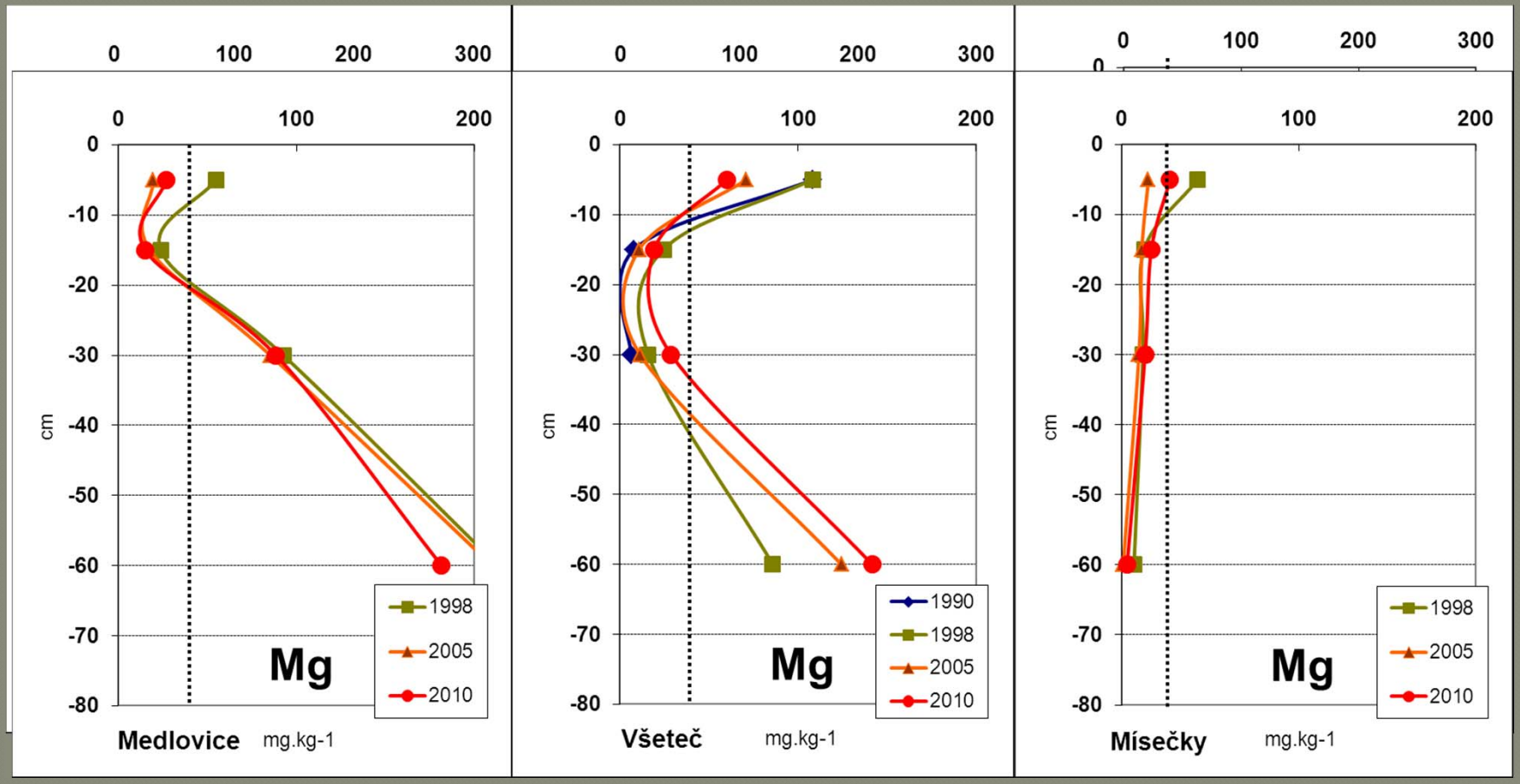
Soil chemistry development



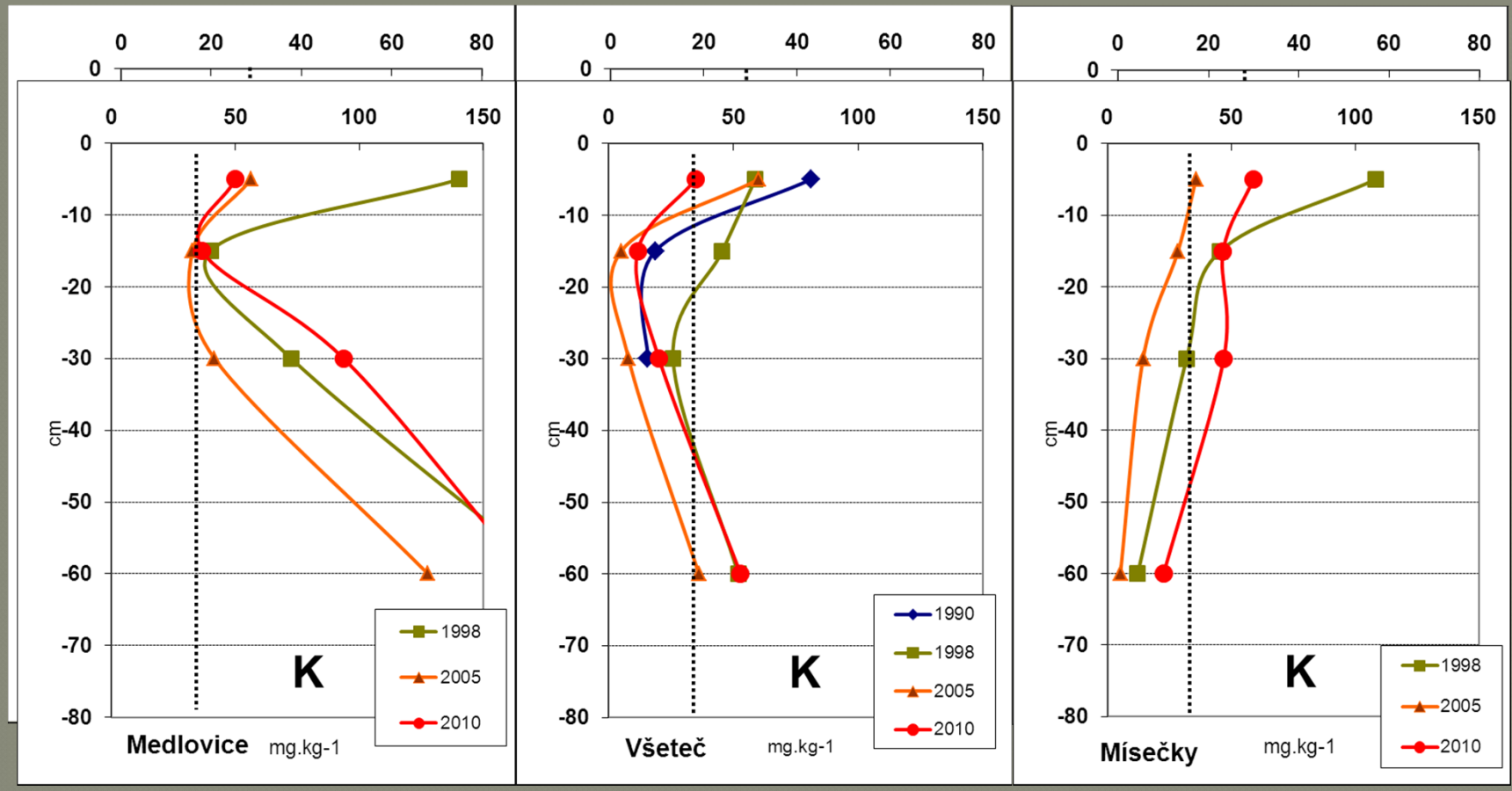
Soil chemistry development



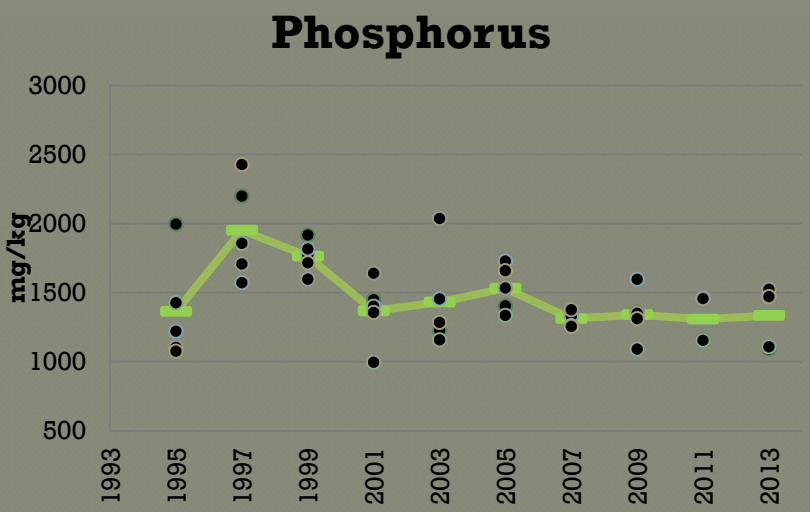
Soil chemistry development

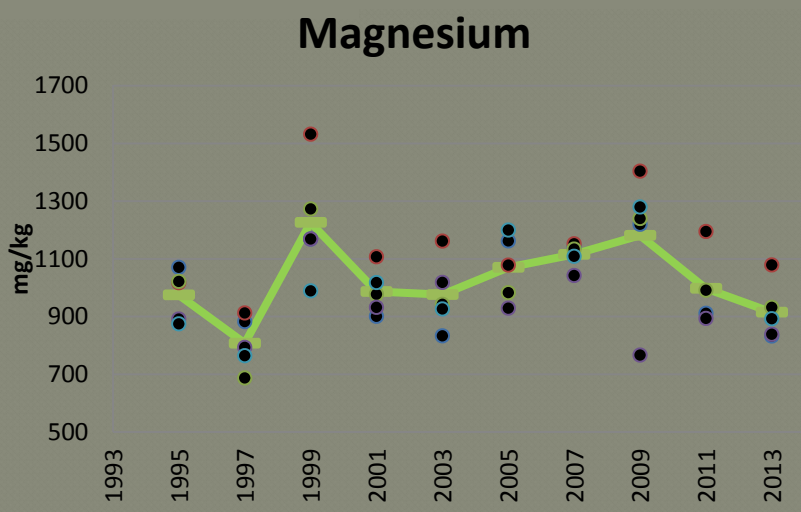


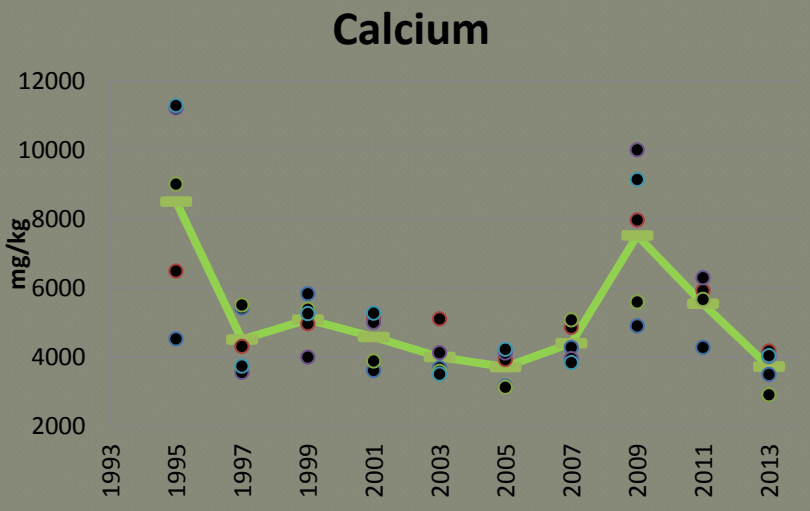
Soil chemistry development

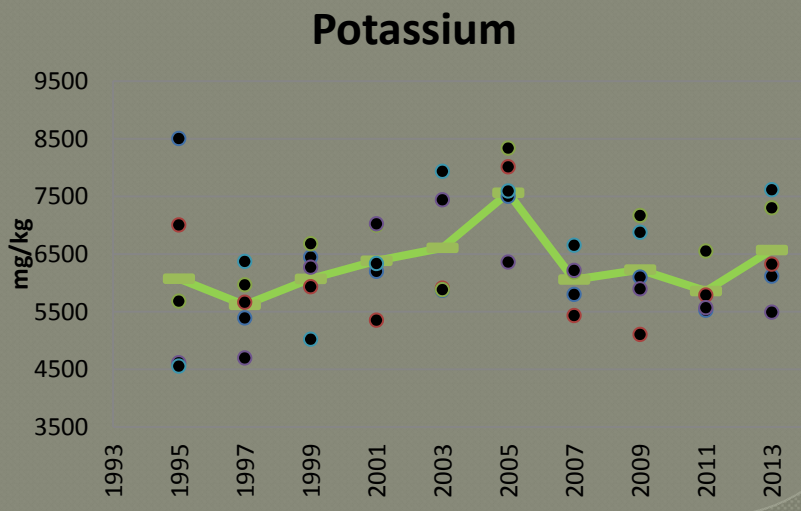


Tree nutrition development Norway spruce, 440 m a.s.l.

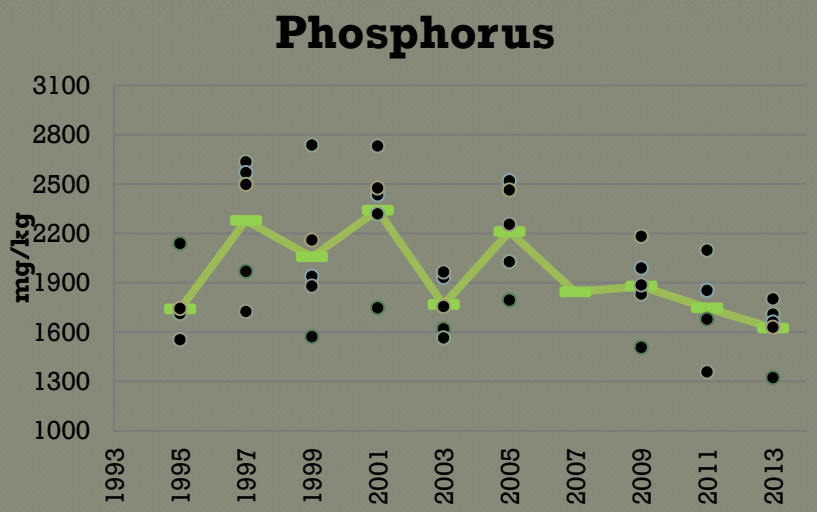


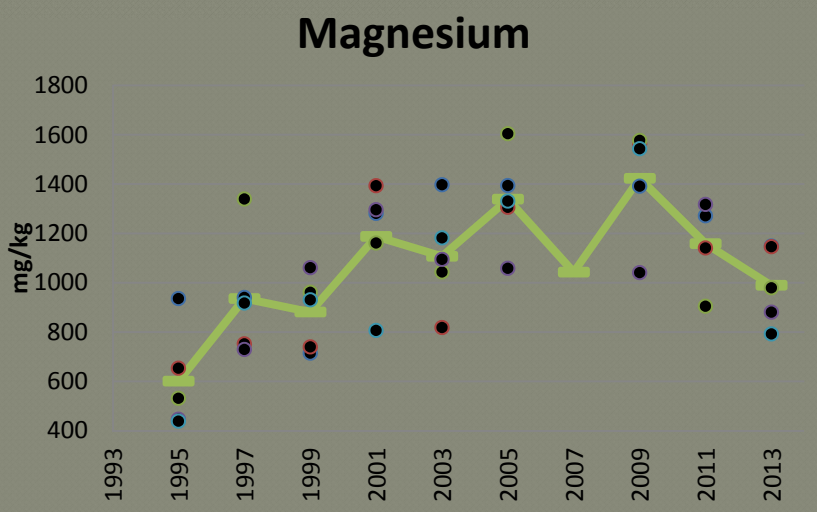


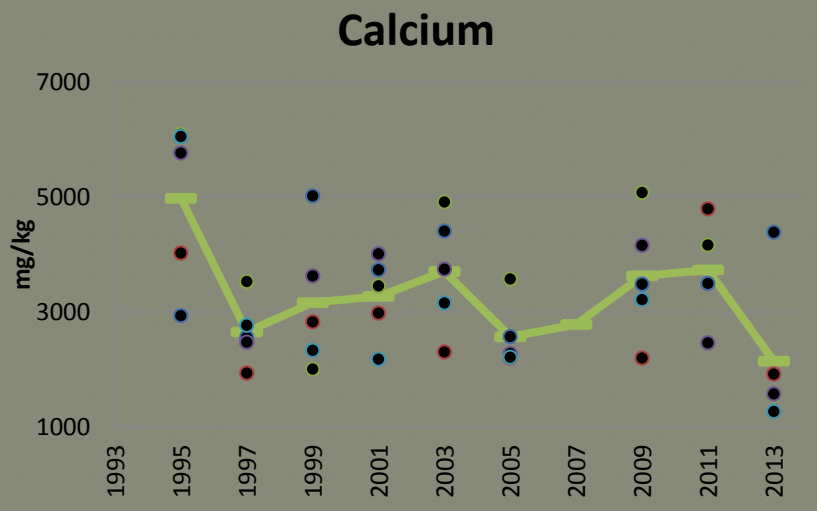


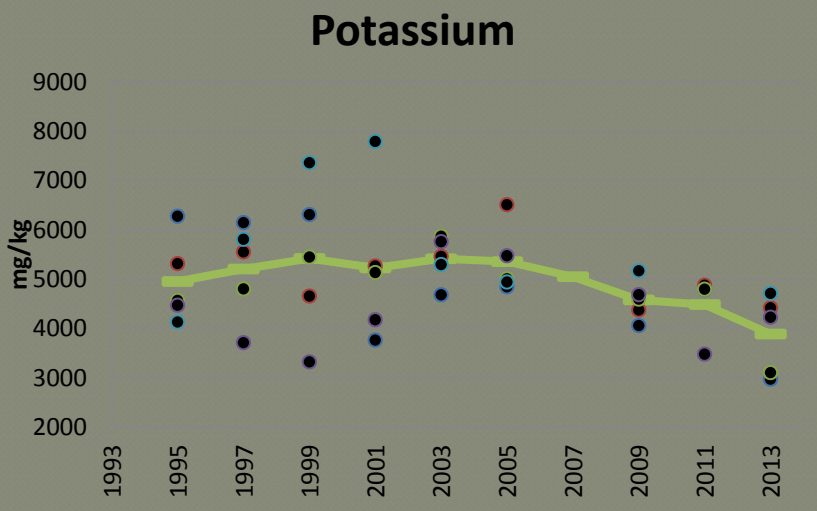


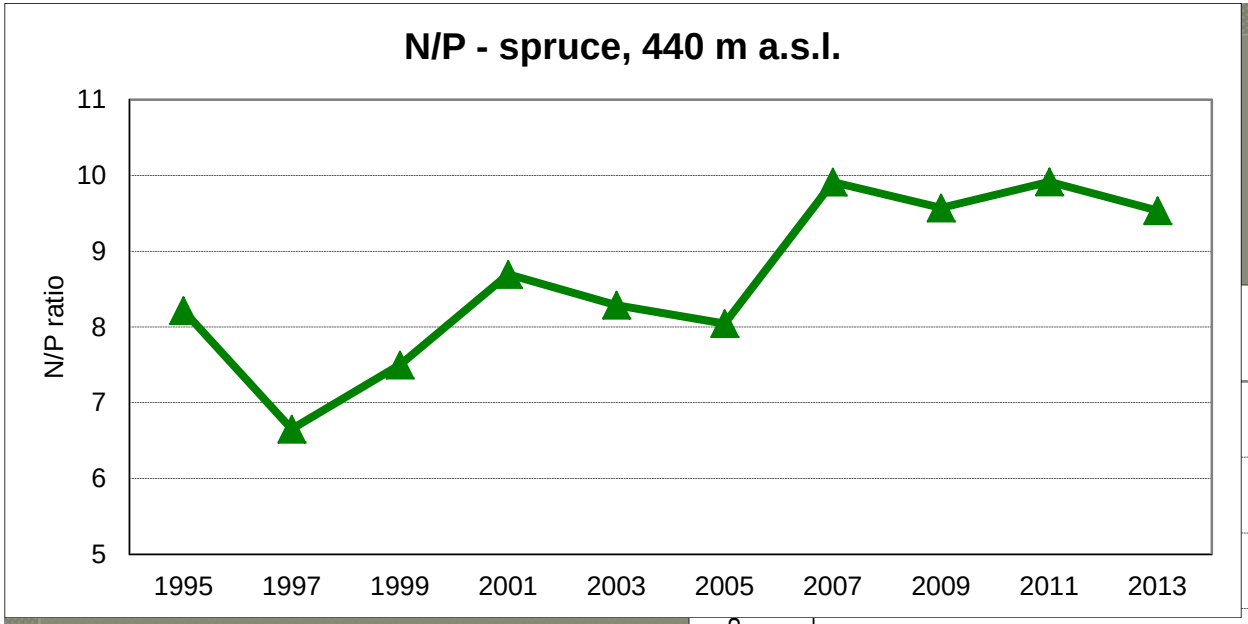
Tree nutrition development Norway spruce, 875 m a.s.l.

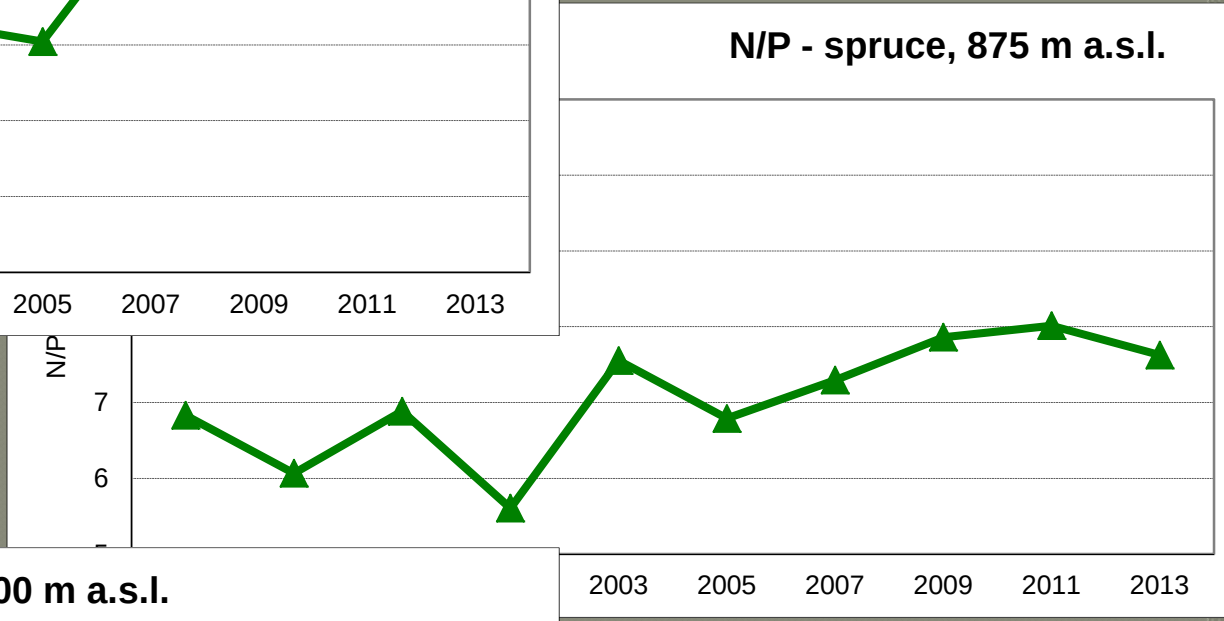


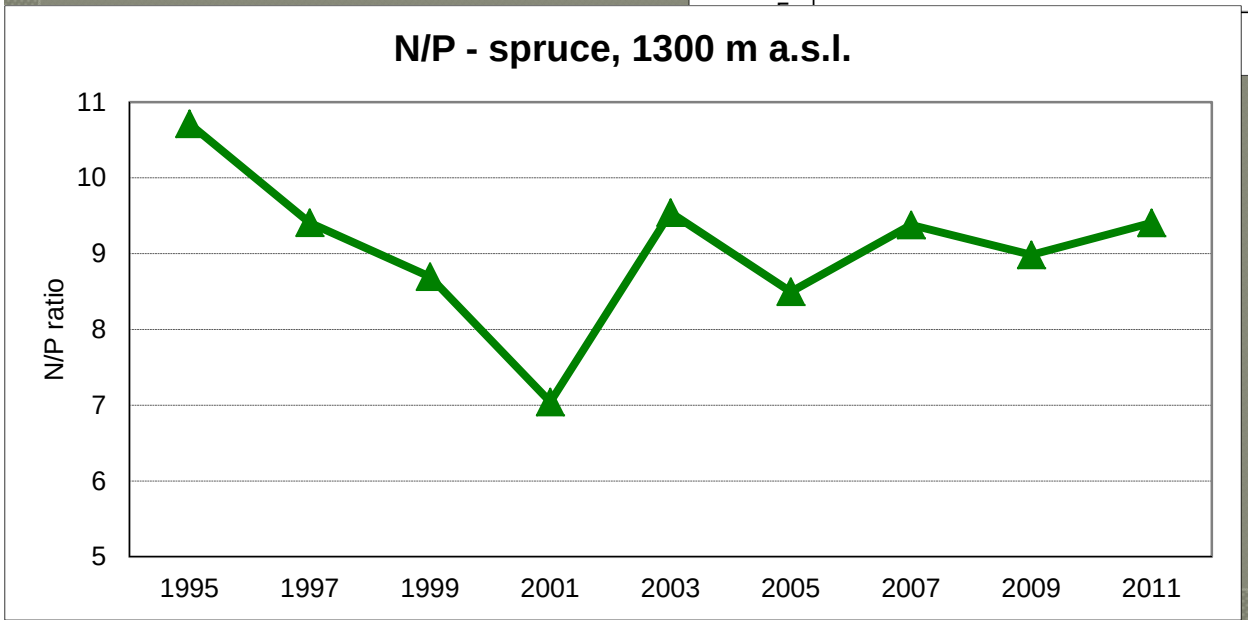




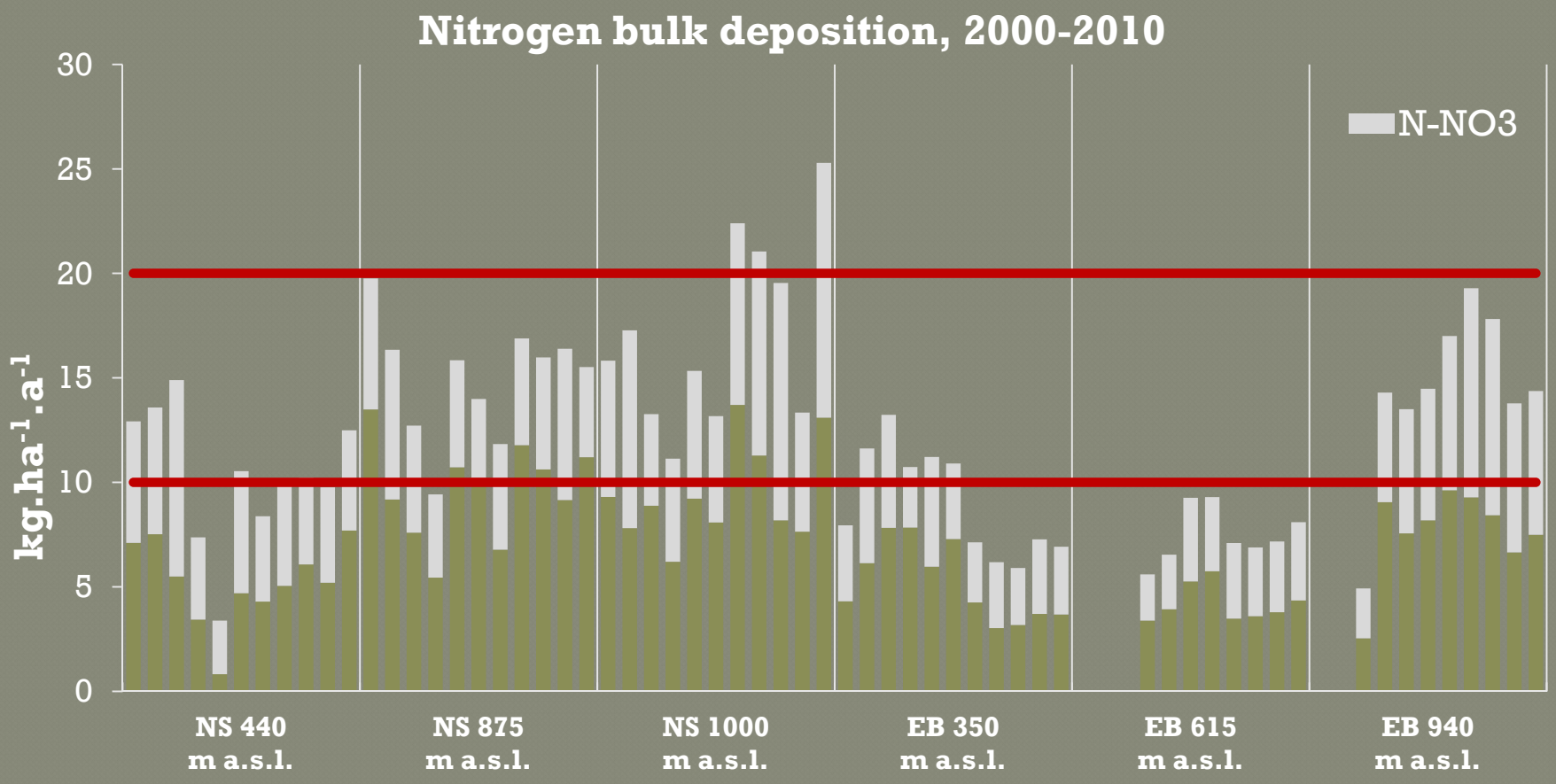



N/P - spruce, 440 m a.s.l.
N/P ratio
11
10
9
8
7
6
5
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013

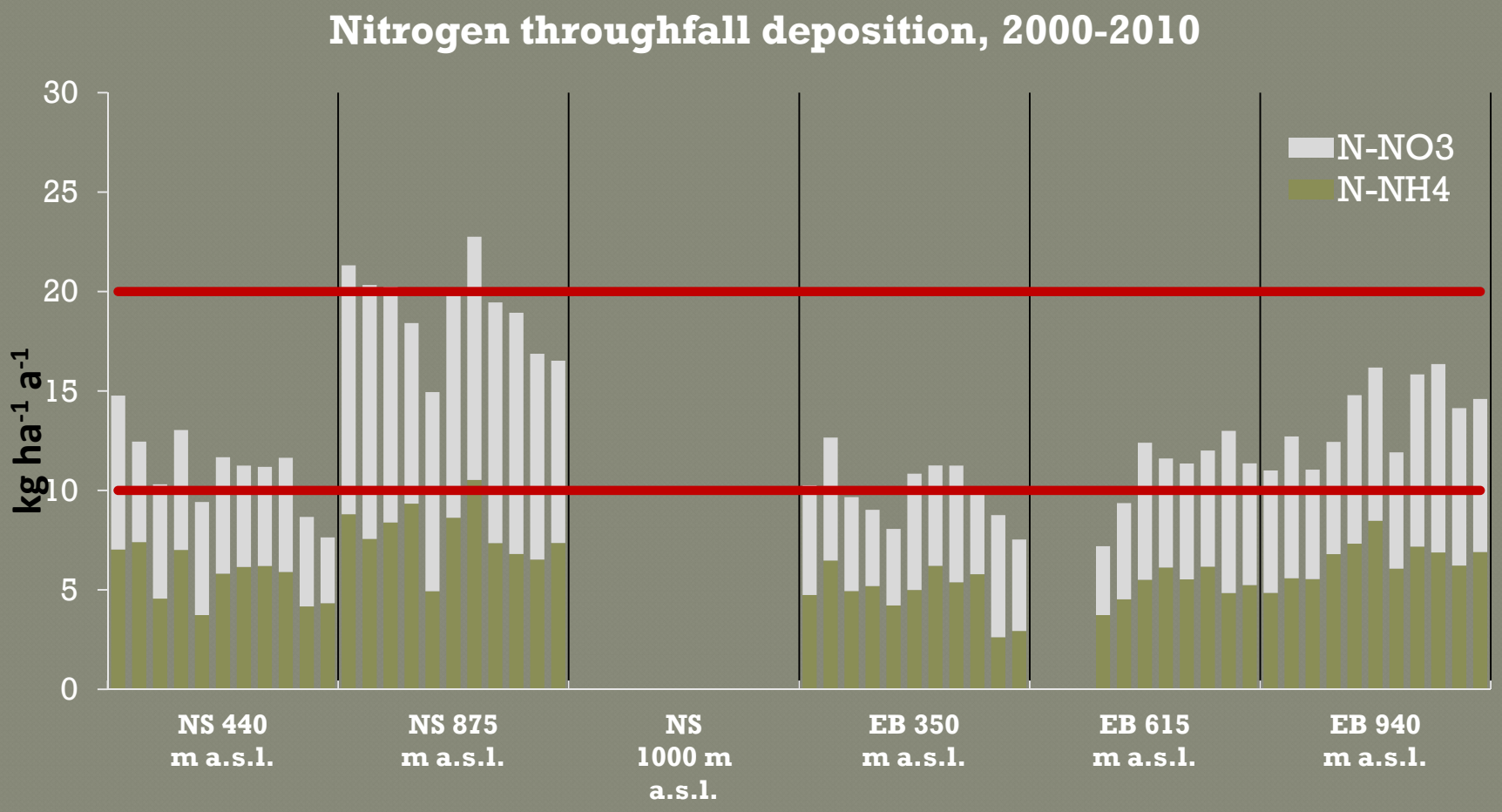

N/P - spruce, 875 m a.s.l.
N/P
7
6
2003
2005
2007
2009
2011
2013


N/P - spruce, 1300 m a.s.l.
N/P ratio
11
10
9
8
7
6
5
1995
1997
1999
2001
2003
2005
2007
2009
2011

Nitrogen deposition level



Nitrogen deposition level



Conclusions

- Soil pH is stable or slightly increasing in last fifteen years.
- There is continuing decrease of exchangeable base cations in mineral soil.
- Most serious decrease has been occurred in layer of maximum rooting.
- On plots with historically highest deposition load the soil is extremely poor on base nutrients within the whole vertical profile independent of tree species.

Conclusions

- Nitrogen deposition is stable or slightly increasing during last 10-15 years.
- In foliage samples the increasing ration of nitrogen to other nutrients has been identified.
- The results indicate potential risk for next generation of forest stands in terms of sustainability of forest management and ecosystem nutrient cycling.

Thank you for your attention

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