The Guadiamar Green Corridor (Sevilla, Spain) is a large-scale example of phytostabilization. After a widely used as a soil remediation practice, known as phytostabilization (Bolan et al. 2011). Afforestation of contaminated soils contributes to immobilization of potentially toxic elements and is trees are ecosystem engineers, modifying soil physico-chemical properties (Aponte et al., 2011).

In this study we explored the chemical composition of five ecosystem compartments: canopy leaves, forest floor, tree roots, top soil and deep soil. The objective was to characterize the chemical heterogeneity at canopy level, originated by mixing seven tree species (Fig. 1), and to evaluate the strength of their footprint on soil properties, about 16 years after plantation.

### Results and discussion

The variation in chemical concentration was highest at the level of canopy leaves and lowest at deep soil (Table 1).

<table>
<thead>
<tr>
<th>Ecosystem compartment</th>
<th>Coefficient of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canopy leaves</td>
<td>81.4</td>
</tr>
<tr>
<td>Forest floor</td>
<td>65.3</td>
</tr>
<tr>
<td>Roots</td>
<td>61.8</td>
</tr>
<tr>
<td>Top soil</td>
<td>25.0</td>
</tr>
<tr>
<td>Deep soil</td>
<td>21.9</td>
</tr>
</tbody>
</table>

The heterogeneity was measured by coefficient of variation (CV). The effects of the tree species was tested by analysis of variance (ANOVA) for each chemical element in each ecosystem compartment. The general tree species footprint on the topsoil was analyzed by PCA.

#### Canopy leaves

Cadmium showed the maximum heterogeneity at canopy level. Tree species was a significant source of variation for the concentration of all the 23 elements (Table 1).

*Populus alba* leaves had the highest concentration of Cd and Zn (Fig. 3). *Quercus ilex* of Mn, and *Celtis australis* of Ba, Ca, Cr, Fe, Na, Pb, Sr and V.

#### Forest floor

The heterogeneity of litter mirrored the patterns of the canopy, with peaks of Cd and Zn under *Populus*, of Mn under *Quercus* (Fig. 3), and of Ca, Na and Sr under *Celtis*. However it was attenuated, showing significant differences among tree species for 17 out of 23 elements (Table 1).

#### Roots

The composition of roots had also a characteristic tree-species signal (Table 1). However, the pattern was quite different from leaves: there was no significantly higher accumulation of Cd and Zn in *Populus* roots. The highest values for Al, As, Cr, Pb and V were found in *Celtis* roots (Fig. 3).

#### Top soil

The heterogeneity in composition of chemical elements in topsoil was lower than in plants (Table 1). Footprint of trees in top soil, after 16 years, was still weak: there was significant difference (p<0.05) among trees for Cd, Co and Li, and marginally (p<0.1) for Cr, Mn and Ni.

Contrasted species were different: topsoil under *Pinus* trees had significantly lower concentration of Cd, Co, Mn, Ni, Zn and Li than topsoil under *Populus* (Fig. 4).

#### Deeper soil

The deeper soil (below 10 cm) had the lowest heterogeneity in chemical composition and there was no significant effect of the species of tree aboveground for any chemical element (Table 1).

### Conclusions

Each tree species has a characteristic chemical composition by selective uptake of soil elements, differential exclusion or accumulation, and transport to leaves reflecting a separation in their biogeochemical niche (sensu Sardans and Peñuelas, 2014). The footprint of tree species on top soil was detectable 16 years after plantation. It is expected to be reinforced with age, contributing to phytostabilization and carbon sequestration.

### References