IVALSA
TREES AND TIMBER INSTITUTE

Progetto BiQueen

Biomass characterization towards contaminants

Martino Negri, Marco Fellin, Anna Sandak

Trees and Timber Institute IVALSA/CNR, via Biasi 75, 38010 San Michele all'Adige (TN), Italy
Biomass characterization towards contaminants
negri@ivalsa.cnr.it fellin@ivalsa.cnr.it anna.sandak@ivalsa.cnr.it


uncontaminated wood

uncontaminated (?) biomass

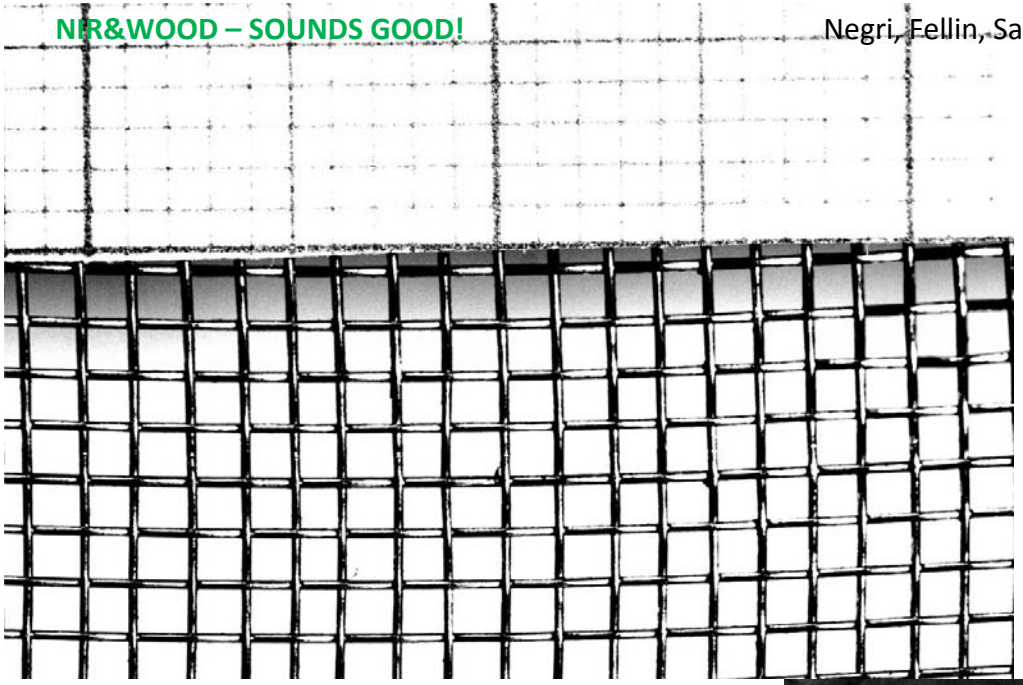
GOALS

- Detection of the occurrence of oil/fuel pollutants on biomasses
- Fast and reliable method
- Detection along the time

APPROACH

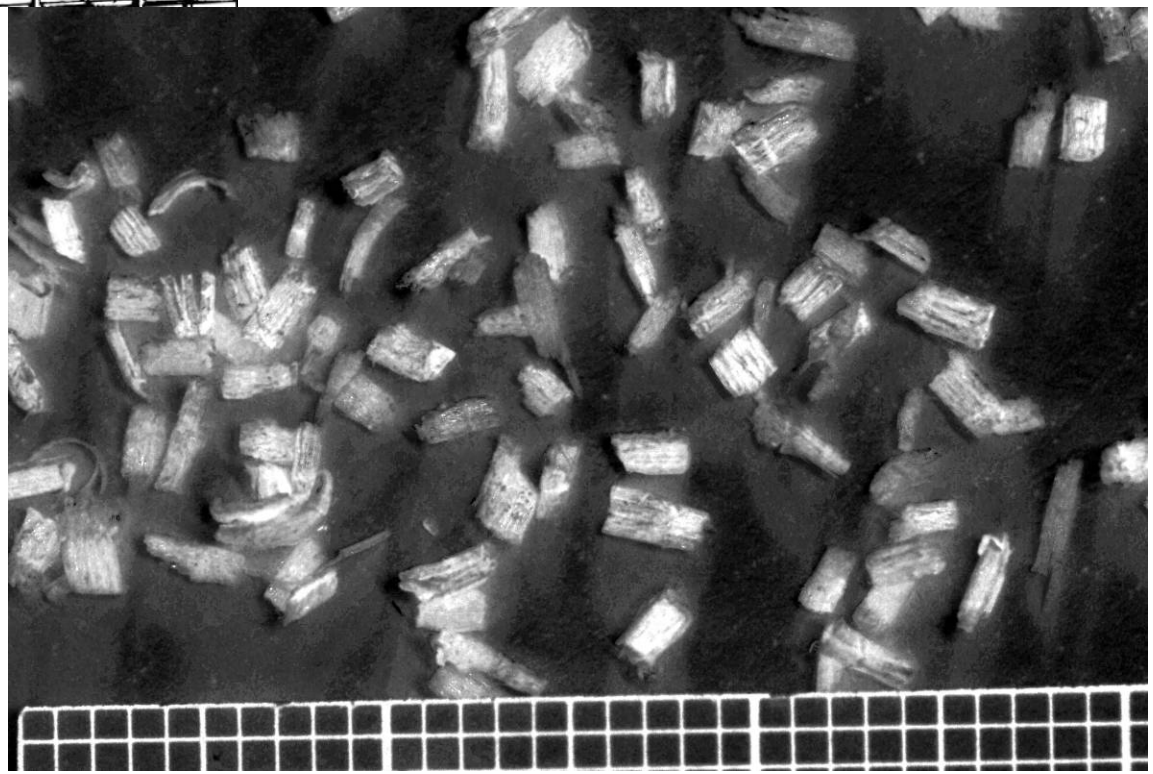
- Pollutants: oil, diesel and fuel
- MIR-ATR + Spectra Libraries (spectral resolution 4 cm-1, average of 64 scans, 3 measurements/sample)
- Dilution of pollutants in a “wood solution” (thin powder)
- Crystal substitution (diamond) due to the hardness
- Tests repeated along the time


Girmi
Potenza 700W
Power 700W
Girmi



Sieve mesh size measures

Image analysis software:
ImageJ

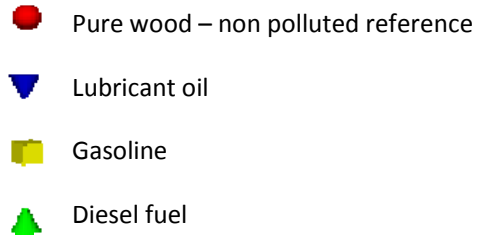


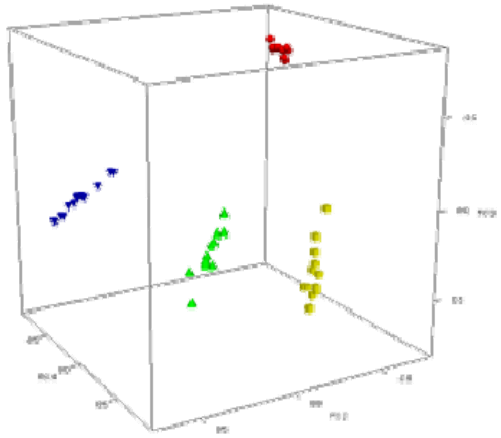
Wood particulate
size measures

- FT-IR pollutants dynamic investigation
- 450 spettra

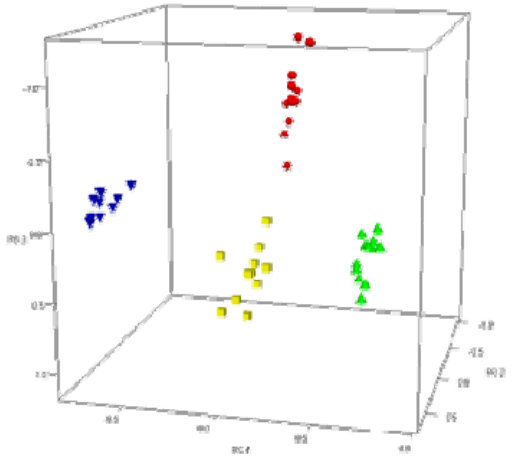
Variable	Description	Code
1 wood species	Abete rosso	
4 dimensional classes	Thin particle	1
	Mid particle	2
	Thickparticle	3
	Raw size particle	4
3 pollutants	Reference - untreated	B
	Lubricant oil	O
	Gasoil	G
	Fuel	U
Time	Time zero	0
	1 day	1d
	1 week	1w
	3 weeks	3w
	3 months	3m
	11 months	11m
	20 months	20m
Concentration	1:1	[1 a 1]
Pollutan:wood	1:2	[1 a 2]
	1:10	[1 a 10]

			process A	process B
particulate	code	size range	planer+mill	planer+mill+chop
label		*mm*	**Quantity of particulate produced [%]**	
raw	4	3,5 ÷ 1,0	46%	31%
thick	3	1,0 ÷ 0,5	24%	25%
medium	2	0,5 ÷ 0,2	23%	32%
thin	1	0,13 ÷ 0,2	4%	6%
powder	-	< 0,13	4%	6%

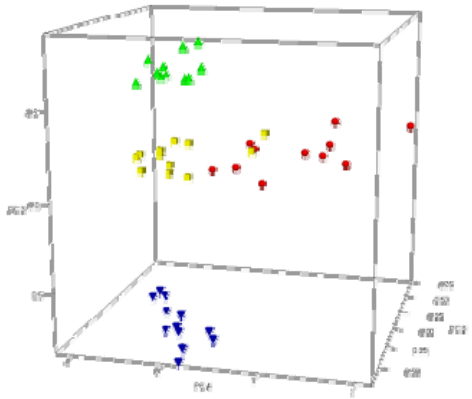




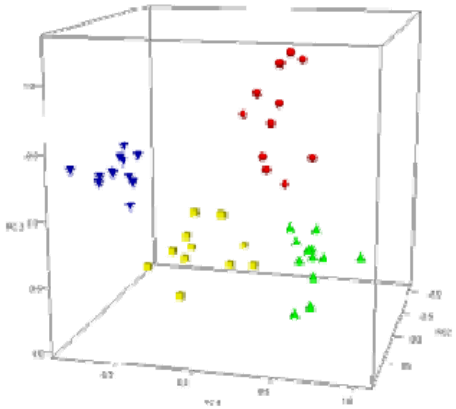
1 hour after the contamination



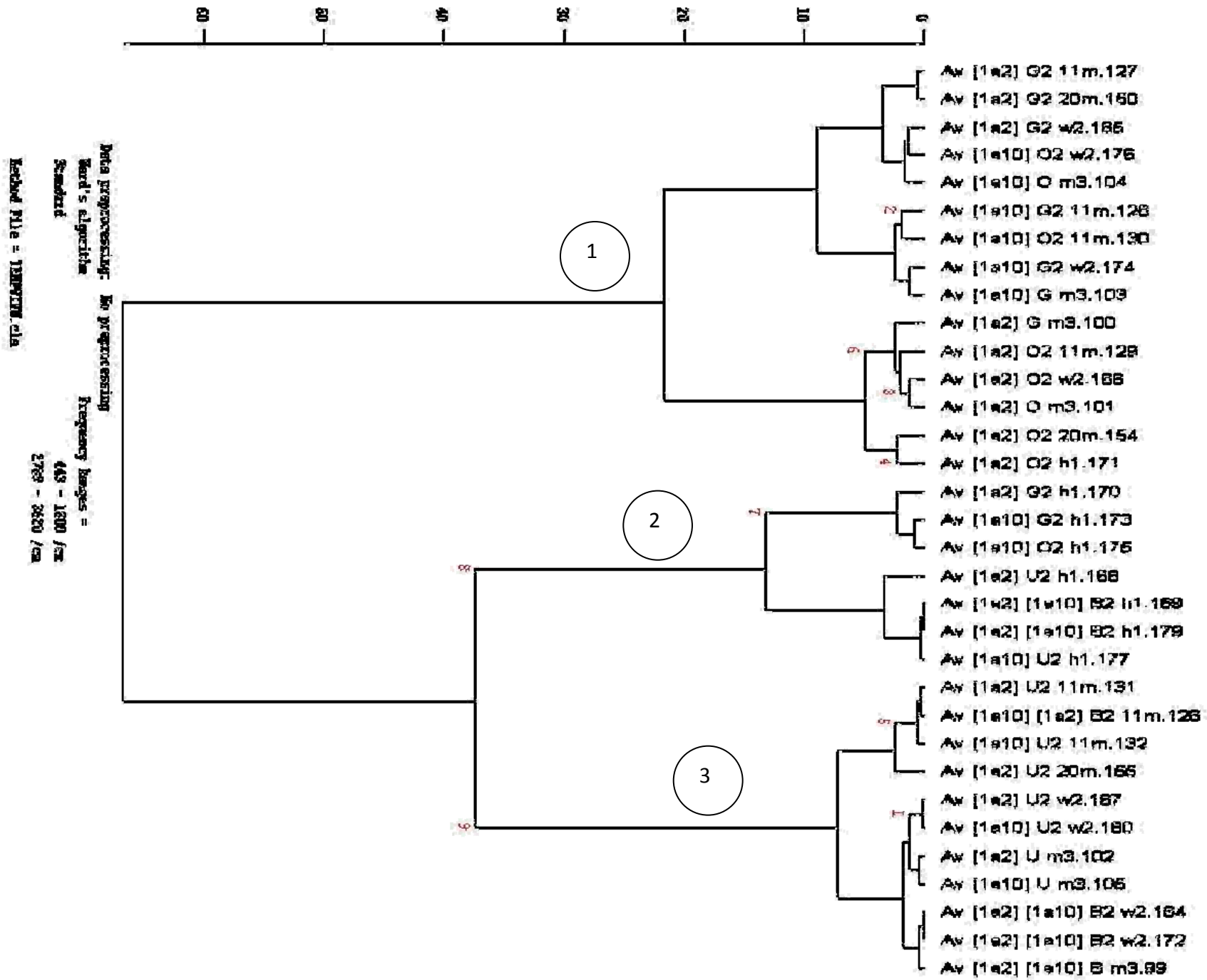
1 week after the contamination



3 weeks after the contamination



20 months after the contamination


Heterogeneity
Data preprocessing: No preprocessing
Ward's algorithm
Standard
Method file = TEMPDM.cla
Frequency ranges =
449 - 1800 /cm
2769 - 3620 /cm
1
2
3
Av [1a2] G2 11m.127
Av [1a2] G2 20m.150
Av [1a2] G2 w2.185
Av [1a10] O2 w2.176
Av [1a10] O m3.104
Av [1a10] G2 11m.126
Av [1a10] O2 11m.130
Av [1a10] G2 w2.174
Av [1a10] G m3.109
Av [1a2] G m3.100
Av [1a2] O2 11m.129
Av [1a2] O2 w2.186
Av [1a2] O m3.101
Av [1a2] O2 20m.154
Av [1a2] O2 h1.171
Av [1a2] G2 h1.170
Av [1a10] G2 h1.173
Av [1a10] O2 h1.175
Av [1a2] U2 h1.168
Av [1a2] [1a10] B2 h1.169
Av [1a2] [1a10] B2 h1.179
Av [1a10] U2 h1.177
Av [1a2] U2 11m.131
Av [1a10] [1a2] B2 11m.126
Av [1a10] U2 11m.132
Av [1a2] U2 20m.166
Av [1a2] U2 w2.187
Av [1a10] U2 w2.180
Av [1a2] U m3.102
Av [1a10] U m3.105
Av [1a2] [1a10] B2 w2.184
Av [1a2] [1a10] B2 w2.172
Av [1a2] [1a10] B m3.99

Thank you