

Supplementary Material

**Molecular biomarkers of anthropic impacts in natural archives: A
review**

Nathalie Dubois*, Jérémy Jacob

*** Correspondence:** Corresponding Author: nathalie.dubois@eawag.ch

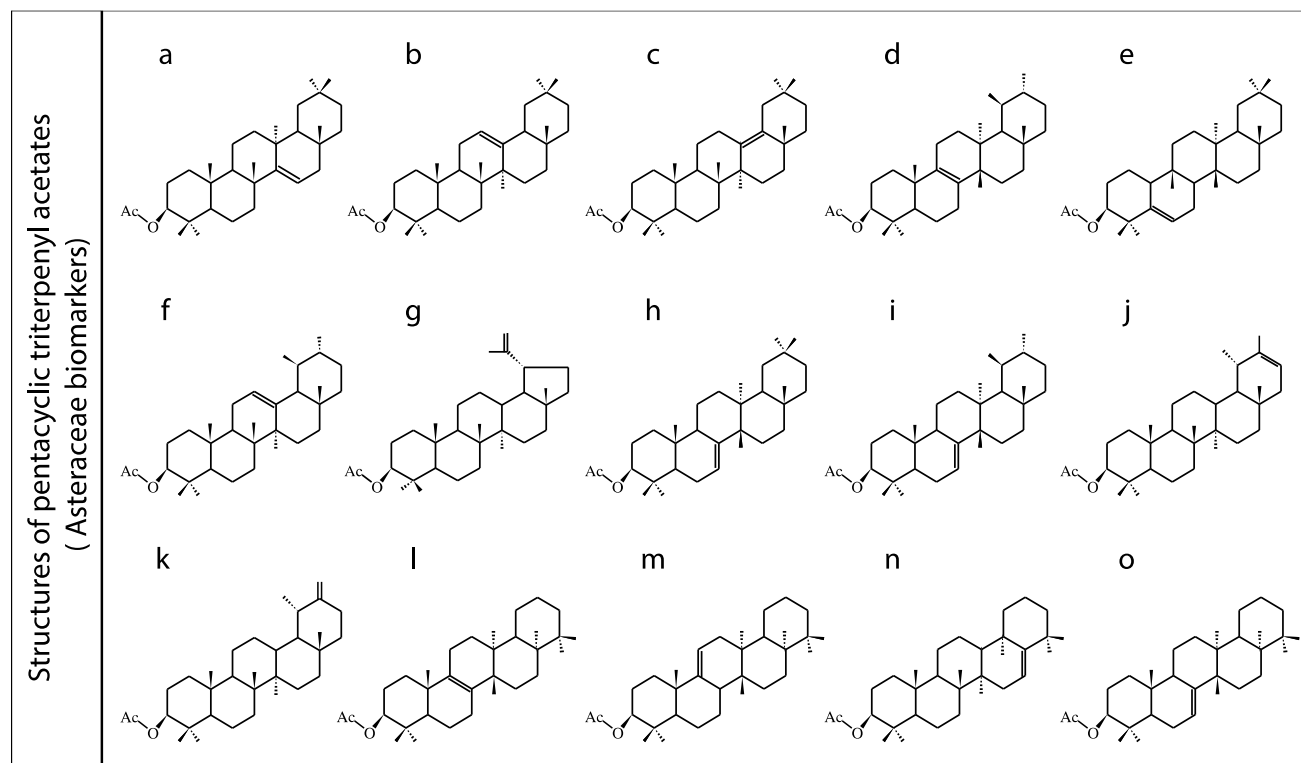
1 Supplementary Figures

1.1 Supplementary Figures

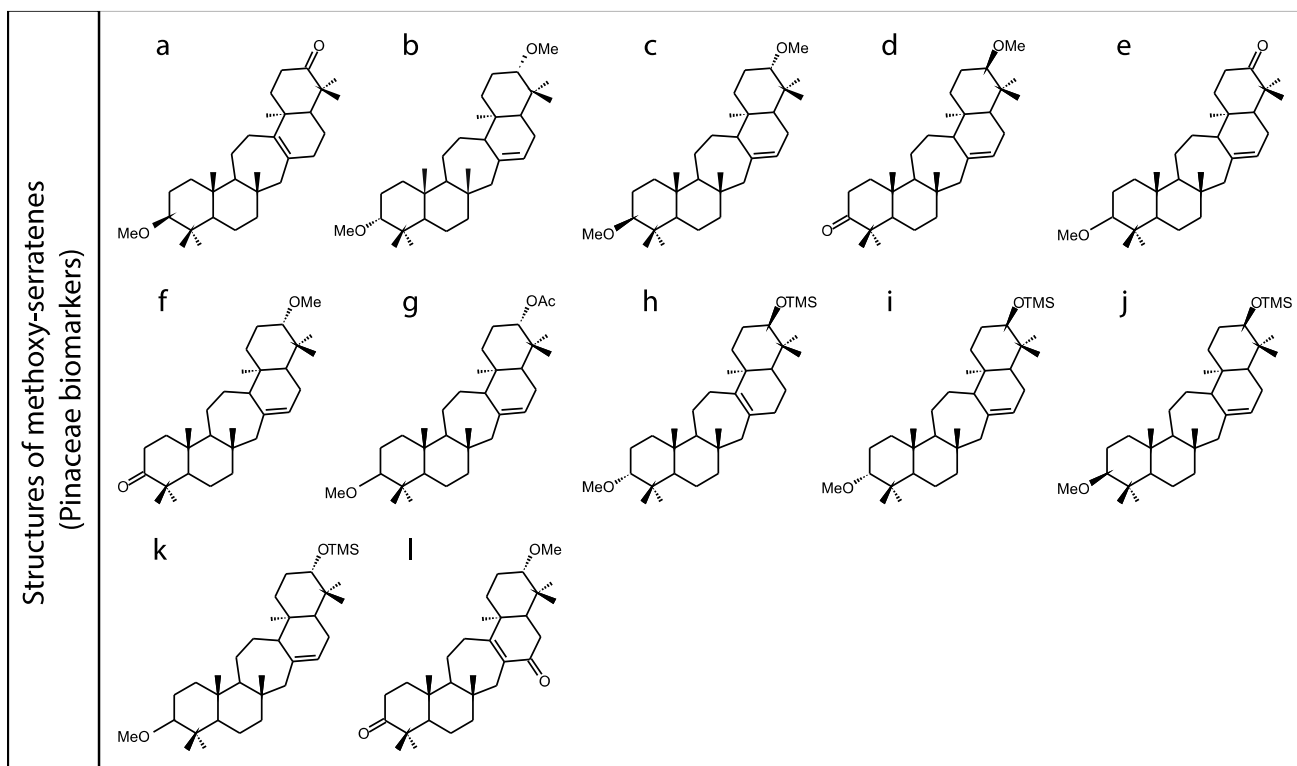
Fire biomarkers	a	b	c	d
Tricyclic diterpenes (Gymnosperm biomarkers)	e	f	g	
Pentacyclic triterpenes (Angiosperm biomarkers)	General structures			
	h	i	j	k
	l	Pentacyclic triterpenes methyl ethers (Graminae biomarkers)		
m	n	o	p	
q	r	s		
Other pentacyclic triterpenes	t	u		

Supplementary Figure 1. Structures of (a) levoglucosan; (b) fluoranthene; (c) pyrene; (d) benz[a]anthracene; (e) abietane; (f) pimarane; (g) phyllocladane; (h) oleanane; (i) ursane; (j) lupane;

(k) fernane; (l) arborane; (m) taraxer-14-en-3 β -ol methyl ether (sawamilletin or crusgallin); (n) olean-12-en-3 β -ol methyl ether (isosawamilletin or β -amyrin methyl ether); (o) urs-12-en-3 β -ol methyl ether (α -amyrin methyl ether); (p) olean-12-en-3 β -ol methyl ether (miliacin or germanicol methyl ether); (q) bauer-7-en-3 β -ol methyl ether; (r) fern-9(11)-en-3 β -ol ME (arundoin); (s) arborinol-9(11)-en-3 β -ol ME (cylindrin); (t) ursolic acid and (u) betulin.



Supplementary Figure 2. Structures of (a) taraxer-14-en-3 β -ol acetate (β -amyrin acetate); (b) olean-12-en-3 β -ol acetate (β -amyrin acetate); (c) olean-13(18)-en-3 β -ol acetate (δ -amyrin acetate); (d) bauer-8-en-3 β -ol acetate (isobauerenyl acetate); (e) glutin-5-en-3 β -ol acetate (glutinyln acetate); (f) urs-12-en-3 β -ol acetate (α -amyrin acetate); (g) lup-20(29)-en-3 β -ol acetate; (h) multi_or-7-en-3 β -ol acetate; (i) bauer-7-en-3 β -ol acetate (bauerenyl acetate); (j) taraxast-20-en-3 β -ol acetate (ψ -taraxasteryl acetate); (k) taraxast-20(29)-en-3 β -ol acetate (taraxasteryl acetate); (l) pichier-8-en-3 β -ol acetate (isopichierenyl acetate); (m) pichier-9(11)-en-3 β -ol acetate (pichierenyl acetate); (n) gammacer-16-en-3 β -ol acetate (gammacerenyl acetate); (o) pichier-7-en-3 β -ol acetate (swertenyl acetate). Modified from Lavrieux et al. (2011).



Supplementary Figure 3. Structures of (a) 3β -methoxy-serrat-13-en-21-one; (b) $3\alpha,21\alpha$ -dimethoxy-serrat-14-ene; (c) $3\beta,21\alpha$ -dimethoxy-serrat-14-ene; (d) 21β -methoxy-serrat-14-en-3-one; (e) 3 -methoxy-serrat-14-en-21-one; (f) 21α -methoxy-serrat-14-en-3-one; (g) 3 -methoxy-serrat-14-en-21 α -yl acetate; (h) 3α -methoxy-serrat-13-en-21 β -ol; (i) 3 -methoxy-serrat-14-en-21 β -ol; (j) 3β -methoxy-serrat-14-en-21 β -ol; (k) 3 -methoxy-serrat-14-en-21 α -ol; (l) 15 -keto- 21α -methoxy-serrat-13-en-3-one. Modified from Le Milbeau et al. (2013).

Supplementary References

Lavrieux, M., Jacob, J., Le Milbeau, C., Zocatelli, R., Masuda, K., Br  heret, J.G., Disnar, J.R. (2011). Occurrence of triterpenyl acetates in soil and their potential as chemotaxonomical markers of Asteraceae. *Org. Geochem.* 42, 1315-1323.

Le Milbeau, C., Lavrieux, M., Jacob, J., Br  heret, J.-G., Zocatelli, R., Disnar, J.-R. (2013). Methoxy-serratenes in a soil under a conifer forest and their potential use as biomarkers of Pinaceae. *Org. Geochem.* 55, 45-54.