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SUPPLEMENTARY DATA

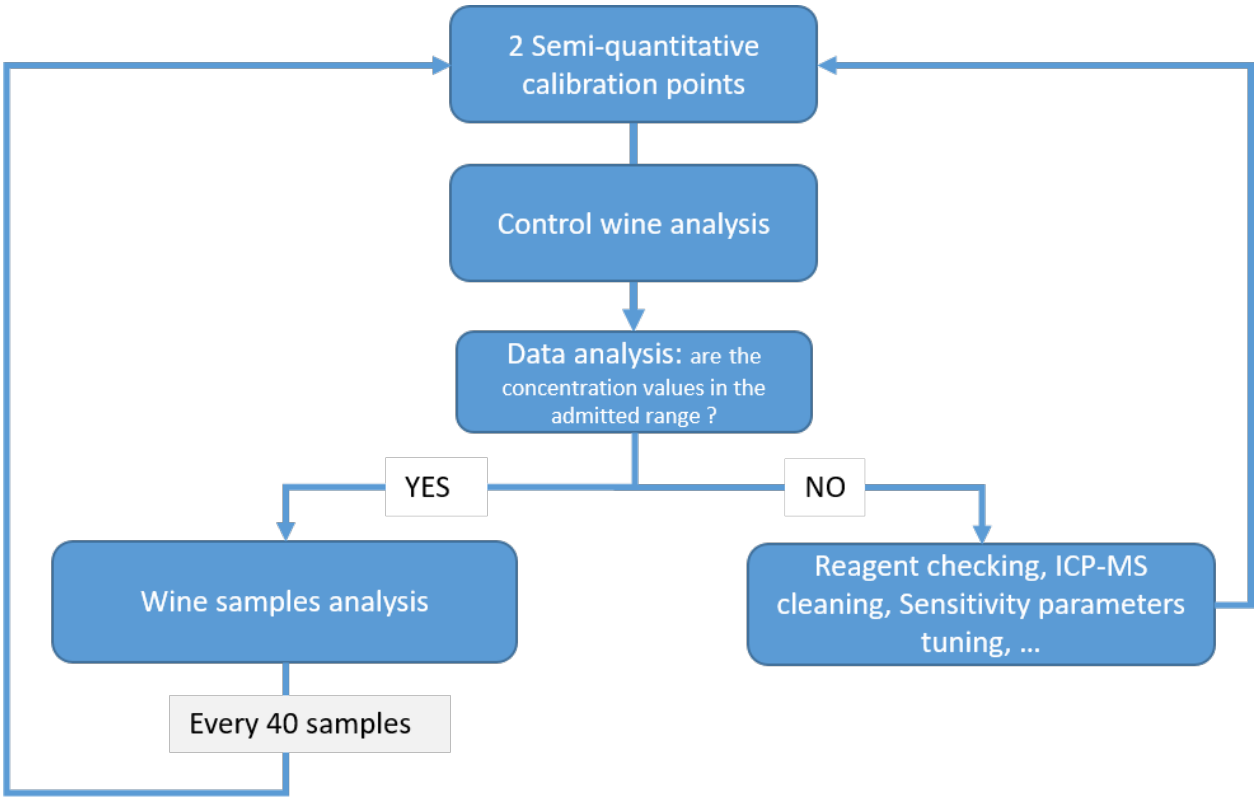


Figure S1. Description of the analytical procedure used for the SQ analysis of wine samples.

SUPPLEMENTARY DATA
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Table S1. Distribution of 12966 analysed samples by country

Country	Number of samples	Country	Number of samples	Country	Number of samples	Country	Number of samples	Country	Number of samples
France	9473	Brazil	160	Austria	82	New Zealand	37	North Macedonia	22
Italy	573	Romania	159	Slovakia	78	Turkey	36	Morocco	16
Spain	496	Canada	152	Germany	70	Croatia	33	Thailand	12
Portugal	229	Moldova	103	Belgium	49	Mexico	28	Japan	10
South Africa	216	Hungary	92	China	45	Argentina	23	Ukraine	8
Switzerland	213	Greece	92	Chile	43	Slovenia	23	Russia	7
Australia	184	Bulgaria	83	Czech Republic	41	United States	20	Kazakhstan	7

Country	Number of samples
Uruguay, Cyprus, England, Serbia, Lebanon, Malta	5

Country	Number of samples
Netherlands, Unknown	2
Colombia, Armenia, Albania, Israel, Luxembourg, Tunisia, Azerbaijan, Kosovo	1

Table S2. Distribution of 9473 analysed French samples by region

Region	Number of samples
Bordeaux	2304
Languedoc-Roussillon	1372
Beaujolais	1340
Unknown	875
Vallée du Rhône	833
Provence	666
Alsace	452
Bourgogne	429
Sud Ouest	417
Val de Loire	320
Champagne	296
Savoie	69
Corse	64
Jura	25
Vin de France	10
Charente	1

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Table S3. Distribution of 12966 analysed samples by principal grape variety

Variety	Number of samples	Variety	Number of samples	Variety	Number of samples	Variety	Number of samples	Variety	Number of samples
Chardonnay	2345	Grenache	139	Vermentino	49	Colombard	26	Négrette	15
Merlot	1748	Riesling	98	Mourvèdre	47	Tannat	23	Grüner Veltliner	15
Unknown	1623	Malbec	95	Rolle	47	Glera	22	Sciaccarello	14
Gamay	1380	Tempranillo	89	Melon	46	Sangiovese	21	Barbera	14
Syrah	1001	Pinot gris	85	Pinot meunier	40	Carignan	20	Duras	13
Grenache noir	762	Viognier	81	Cabernet-sauvignon	39	Clairette blanche	19	Marsanne	13
Cabernet Sauvignon	387	Grenache blanc	81	Sylvaner	34	Marselan	18	Primitivo	12
Muscat	386	Sémillon	75	Auxerrois	33	Petit Manseng	18	Nielluccio	12
Variety	Number of samples	Variety	Number of samples	Variety	Number of samples	Variety	Number of samples	Variety	Number of samples
Sauvignon blanc	313	Gewürztraminer	73	Chenin Blanc	33	Montepulciano	17	Nero D'Avola	12
Pinot noir	298	Cinsault noir	65	Gros Manseng	31	Piquepoul blanc	16	Aligoté	11
Cabernet Franc	200	Carignan noir	62	Roussanne	29	Kékfrankos	15	Feteasca Neagra	11
Cinsault	198	Pinot blanc	51	Grenache gris	27	Caladoc	15	Touriga Nacional	11

Variety	Number of samples
Petit Verdot, Altesse	10
Corvina, Mencía, Sauvignon, Prieto Picudo, Mauzac, Fer Servadou	9
Cabernet, Muscat Ottonel, Chasselas, Loin de l'oeil	8
Aglianico, Braucol, Macabeu, Verdejo, Ugni Blanc, Zweigelt	7

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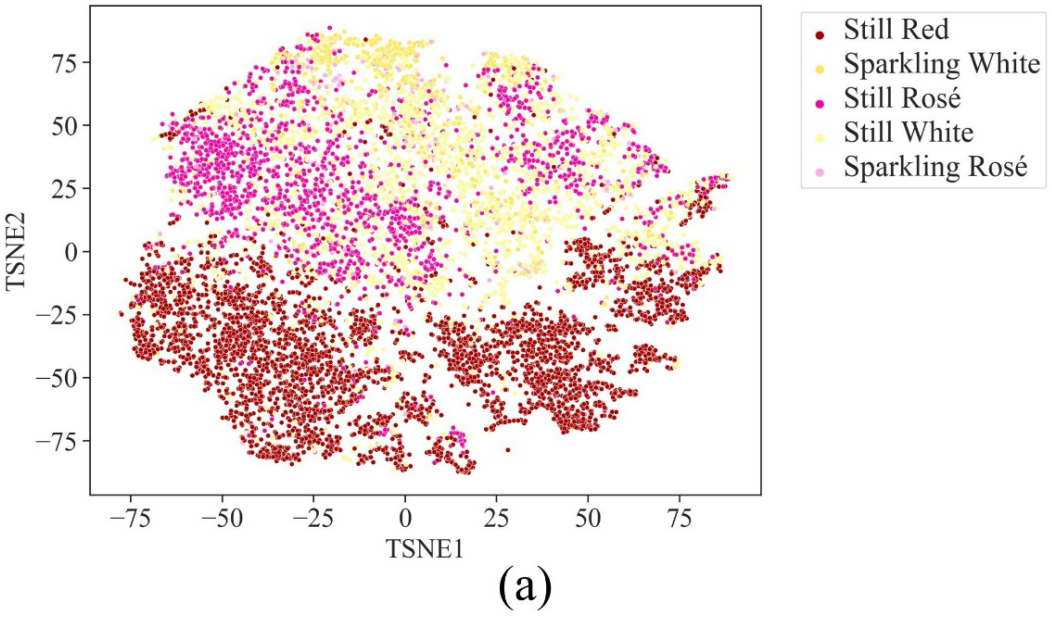
Grillo, Sauvignon gris, Welschriesling, Nebbiolo, Jacquère, Muscadelle	6
Blaufränkisch, Malagousia, Viura, Negroamaro, Alvarinho, Gamaret, Moscato, Raboso, Mondeuse, Côt, Cabernet Gernischt	5
Gaglioppo, Molette, Albarin Blanco, Loureiro, Listan noir, Frankovka, Cabernet Dorsa, Tinta roriz, Savagnin rose, Pecorino, Savagnin, Castelão, Bourboulenc, Traminer, Garnacha	4
Pinot Grigio, Souvignier Gris, Cabernet Cortis, Scheurebe, Nerello Mascalese, Feteasca Regala, Airen Chatus Vidiano Malvasia, Pinot Auxerrois, Sauvignac	3
Cabernet Blanc, Viosinho, Feteasca Alba, Poulsard, Arinto, Roussette, Liatiko, Kotsifali, Kalecik Karasi, Groppello, Godello, Cabernet Jura, Devín, Listan blanc, Roter Veltliner, Síria, Muscat de Hambourg, Catalanesca, Jaén, Pinotage, Aragones, Nero di Troia, Cataratto Bianco, Terret blanc, Muller-Thurgau, Tintilia, Trebbiano, Monastrell, Zweigeltrebe, Mavrud, Trepat, Acolon, Monica, Nerello Calabrese, Greco Nero, Greco Bianco	2
Friulano, Dolcetto, Agiorgitiko, Viorica, Counoise Muscat à petits grains, Croatina Verdicchio Passerina, Saperavi, Diolinoir, Cabernet Dorio, Verdelho, Mondeuse blanche, Tinta de Toro, Muscaris, Merseguera, Cabernet Moravia, Pinenc, Melnik, Touriga franca, Blauer Silvaner, Saint-Laurent, Moscatel, Tamaioasa Palomino, Verduzzo, Roupeiro, Castellana, Ruché, Bronner, Xinomavro, Tinta del Pais, Roesler, Camaralet, Divico, Žlahtina, Sercial, Tempranillo Blanc, Biancu Gentile, Carménère, Fumin, Moschofilero, Erbaluce, Rotgipfler, Cannonau, Aléatico, Muscat d'Alexandrie, Kerner, Mavroudi, Bouchet, Neuburger, Grolleau, Marzemino, Klevner, Regent, Johanniter, Susumaniello Recantina, Dunkelfelder, Muscat rouge à petits grains, Antão Vaz, Grolleau Gris, Malvasia di Candia, Breslava, Hetera, Fernão Pires, Petite Sirah, Hibernal, Alibernet, Pálava, Babeasca neagra, Tamaioasa Romaneasca, Chasan, Prunelart, Okuzgozu, Emir, Piedirosso, Muskateller, Arneis, Tinta barroca, Vidoc, Frontenac, Marquette, Egiodola, Lambrusco, Croatina, Verdicchio	1

Table S4. Lambda values for Box-cox transformation. The values are calculated using *scipy.stats.boxcox function.*

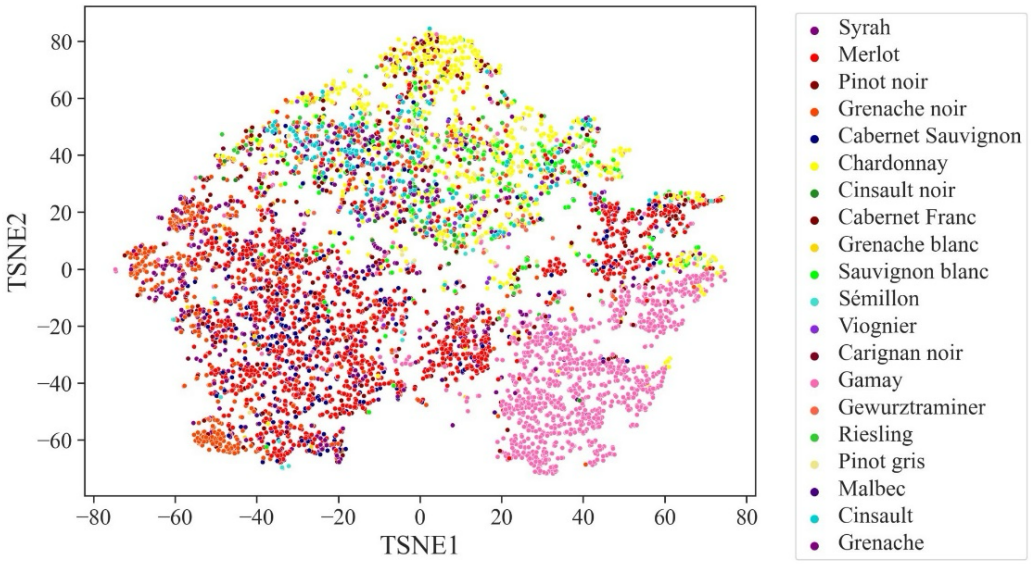
Element	Lambda	Element	Lambda	Element	Lambda
B	0.369	Fe	0.105	Sn	0.260
Na	0.030	Co	-0.015	I	0.259
Mg	0.278	Ni	-0.028	Cs	-0.061
Al	-0.034	Cu	0.046	Ba	0.116
P	0.171	Zn	0.183	La	0.153
S	-0.001	As	0.292	Ce	0.119
Cl	-0.114	Br	0.283	Pr	0.014
K	0.391	Rb	0.201	Nd	-0.015
Ca	0.265	Sr	-0.043	Sm	-0.563
Ti	0.285	Y	0.218	W	0.210
V	0.006	Zr	0.127	Tl	0.222
Cr	-0.136	Nb	0.176	Pb	-0.089

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Figure S 2. t-SNE representation of international MWP samples according to type (a) and main grape variety for French wines (b) of the 10 first principal components (67% of total variance).



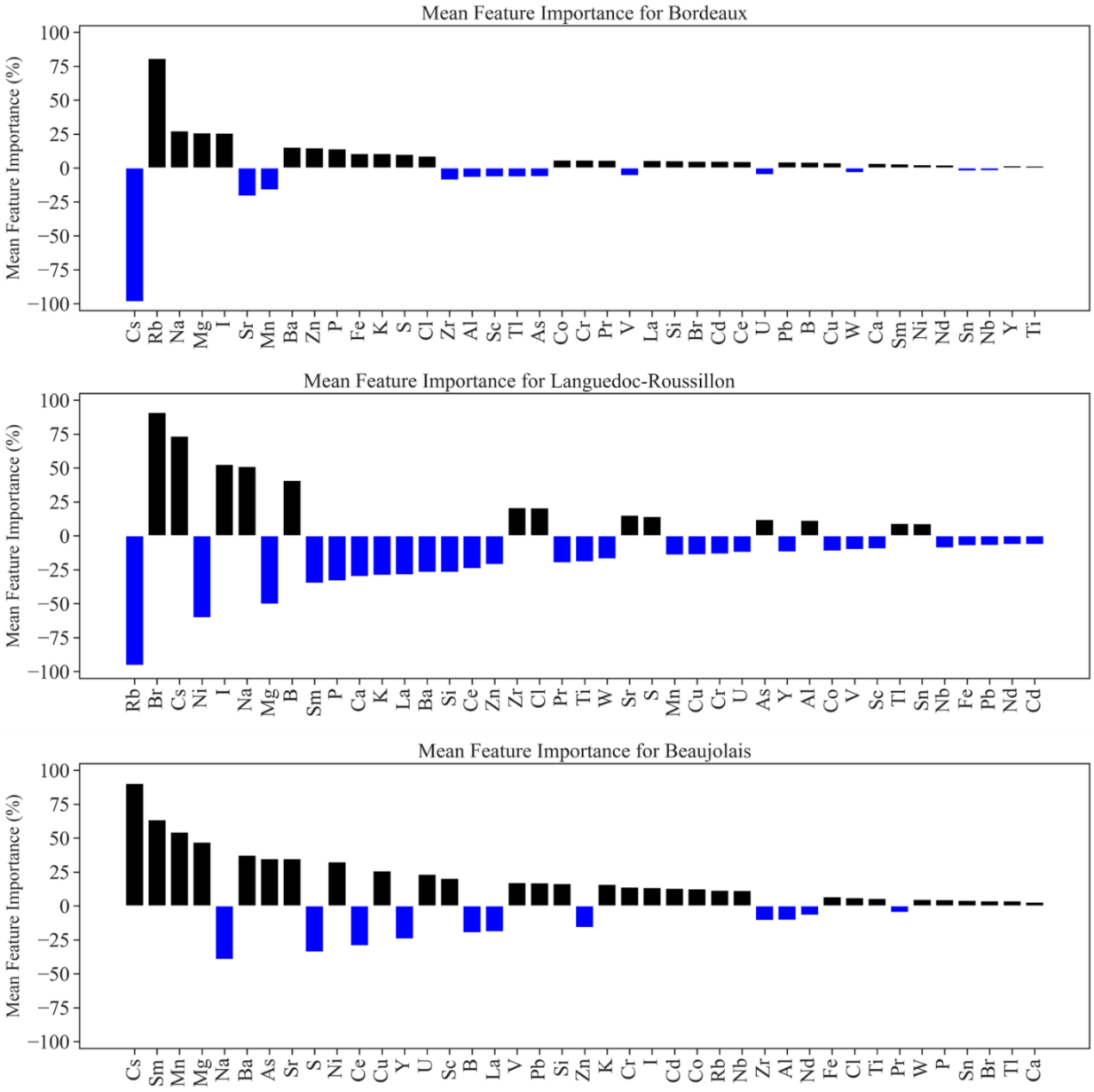
(a)



(b)

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Figure S3. Elements Mean Feature Importance for the three main Frenchs region. Values are presented in decreasing order of importance. Values in black indicate positive correlations and values in blue, negative correlations between the element's concentration and the wine category.



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Figure S4. Elements Mean Feature Importance for the three main grape varieties. Values are presented in decreasing order o importance. Values in black indicate positive correlations and values in blue, negative correlations between the element's concentration and the wine category.

