Help documentation of ISGC

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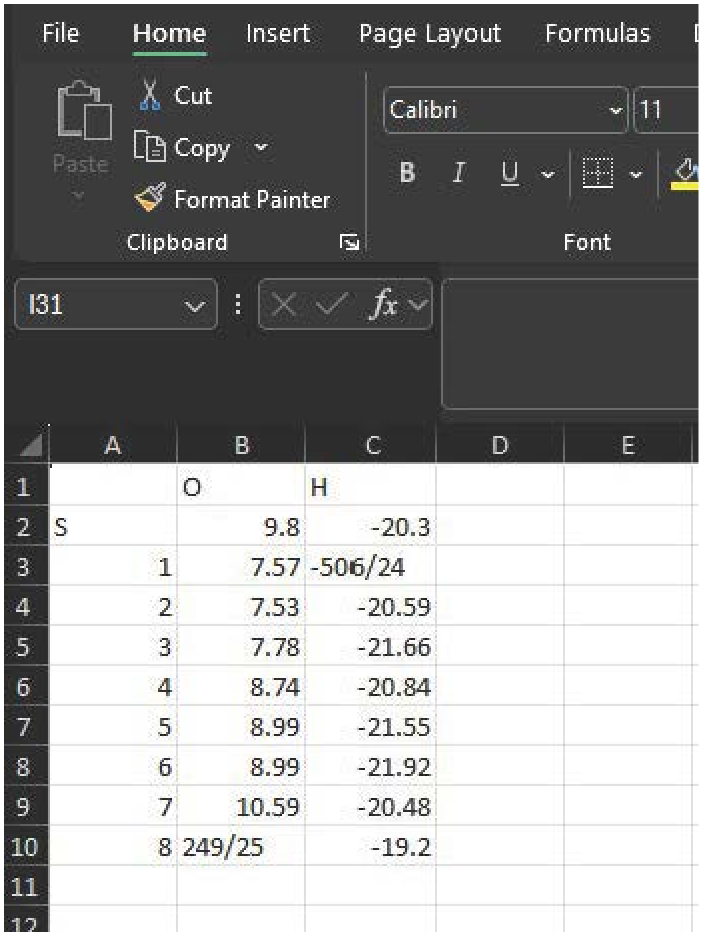
This software is specifically designed to solve underdetermined isotopic mass balance equations. It can also be used to solve underdetermined linear equations. Currently, the software is only suitable for solving underdetermined isotopic mass balance equations involving dual isotopes. The capability to solve mass balance equations with more than dual isotopes will be developed in the future. The latest version of the software can be downloaded from the website. If you have any questions, please feel free to discuss them on the webpage or contact me directly.

This software calculates the contribution ratios of various sources to the sink using data imported from Excel. The software imports data from the first row of the second and third columns in the first sheet of the Excel file, and any other data will not be imported. For example, consider the Figure 1. The Excel data should conform to the following rules:

1. The first row of the second and third columns is considered the isotope types, so the content in cells B1 and C1 of the Excel file will not be used in the calculations by the software;
2. The second row of the second and third columns will be extracted as the isotope values of the sink, while the data in the third row and below will be interpreted as the measured isotope values of the sources. For example, in the case shown in the Figure 1, the sink is in row **S**, and the sources are in rows 3–10, meaning the software will calculate the contributions of 8 sources to the sink **S**;
3. The data in the third row and below of the second and third columns can be in decimal or fractional form.

The case represented in Figure 1 is based on data from Doan et al. (2023) and has been organized by Zeng to form a typical distribution of contributions from multiple sources to a single sink, as detailed in the Figure 2.

The two cases in Figure 3 are consistent with Figure 1, so the software will produce the same results. However, importing the data from Figure 4 into the software will result in an error, as the data in Figure 4 does not meet the software's data requirements.



	A	B	C	D	E
1		O	H		
2	S	9.8	-20.3		
3	1	7.57	-506/24		
4	2	7.53	-20.59		
5	3	7.78	-21.66		
6	4	8.74	-20.84		
7	5	8.99	-21.55		
8	6	8.99	-21.92		
9	7	10.59	-20.48		
10	8	249/25	-19.2		
11					

Figure 1: The example for ISGC

You can double-click here to open all the sample data referenced in this document. Wishing you success in your research.

References

Doan, Karolina et al. (2023). "Evolutionary History of the Extinct Wolf Population from France in the Context of Global Phylogeographic Changes throughout the Holocene". In: *Molecular Ecology* 32.16, pp. 4627–4647. ISSN: 1365-294X. DOI: 10.1111/mec.17054.

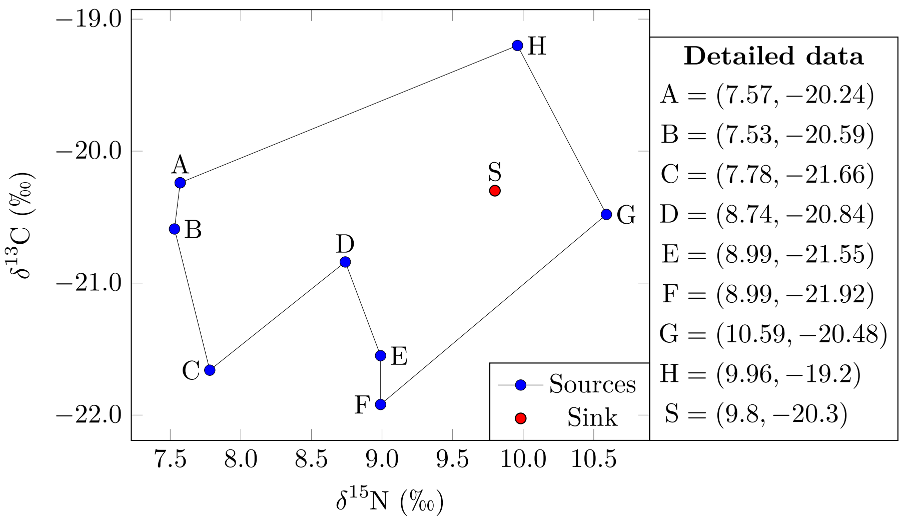


Figure 2: The isotopic distribution characteristics corresponding to the Figure 1 (see Zeng for details).

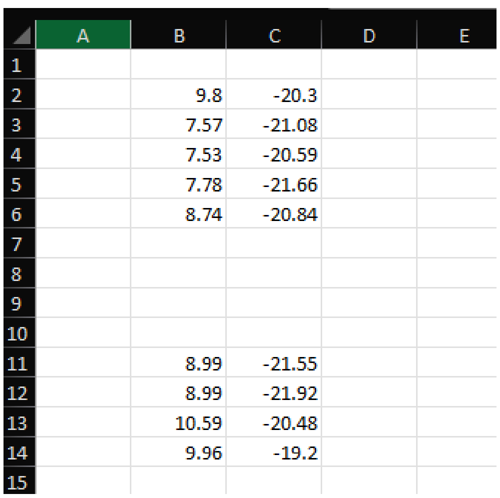
	A	B	C	D
1				
2		9.8	-20.3	
3		7.57	-21.08	
4		7.53	-20.59	
5		7.78	-21.66	
6		8.74	-20.84	
7		8.99	-21.55	
8		8.99	-21.92	
9		10.59	-20.48	
10		9.96	-19.2	
11				

(a) Same as Figure 1

	A	B	C	D	E	F	G	H	I
1	0.702586	0.702586	0.199063	0.702586	0.199063	0.794438	0.208728	0.042122	0.453
2	0.612767	9.8	-20.3	0.612767	0.108776	0.069031	0.367741	0.882483	0.086
3	0.634078	7.57	-21.08	0.634078	0.807621	0.443263	0.127697	0.725658	0.527
4	0.472776	7.53	-20.59	0.472776	0.714187	0.19481	0.910652	0.814063	0.783
5	0.003784	7.78	-21.66	0.003784	0.320351	0.36757	0.567336	0.418172	0.830
6	0.820181	8.74	-20.84	0.820181	0.85004	0.838643	0.483439	0.917783	0.519
7	0.336693	8.99	-21.55	0.336693	0.111292	0.285832	0.120632	0.348141	0.813
8	0.289551	8.99	-21.92	0.289551	0.751548	0.168627	0.757205	0.311526	0.537
9	0.797319	10.59	-20.48	0.797319	0.563693	0.590929	0.097831	0.187036	0.299
10	0.404992	9.96	-19.2	0.404992	0.918235	0.181825	0.873689	0.357557	0.737
11	0.692305			0.692305	0.419984	0.471345	0.971031	0.839086	0.198
12	0.946364			0.946364	0.430873	0.781834	0.338875	0.645229	0.464
13	0.002947			0.002947	0.663717	0.37731	0.422372	0.818897	0.807
14	0.735846			0.735846	0.010209	0.753052	0.219761	0.099847	0.490
15	0.63515			0.63515	0.896379	0.949566	0.559636	0.451961	0.833
16	0.925987			0.925987	0.272308	0.159636	0.663645	0.653407	0.25
17	0.617451			0.617451	0.861851	0.579522	0.524993	0.928966	0.970
18	0.473831			0.473831	0.149573	0.815738	0.555808	0.159514	0.703
19	0.500253			0.500253	0.145405	0.741644	0.786293	0.535661	0.174
20	0.78157			0.78157	0.43581	0.474085	0.170585	0.377984	0.003
21	0.519236			0.519236	0.118152	0.286603	0.376466	0.597498	0.316
22	0.420687			0.420687	0.901161	0.185118	0.263556	0.340068	0.900
23	0.554111			0.554111	0.603777	0.131694	0.476705	0.381754	0.908
24	0.238159			0.238159	0.962831	0.314799	0.00765	0.378177	0.486
25	0.00282			0.00282	0.466556	0.721117	0.516662	0.874384	0.006
26	0.406928			0.406928	0.327481	0.03129	0.281095	0.929238	0.082
27	0.183571			0.183571	0.202971	0.313889	0.058569	0.242523	0.059
28	0.84086			0.84086	0.808189	0.21319	0.344368	0.5454	0.994
29	0.286993			0.286993	0.560088	0.396117	0.685476	0.542847	0.882
30	0.62843			0.62843	0.437905	0.33127	0.240751	0.00354	0.271
31	0.546536			0.546536	0.67502	0.113695	0.116926	0.05049	0.34

(b) Same as Figure 1

Figure 3: All same as Figure 1



	A	B	C	D	E
1					
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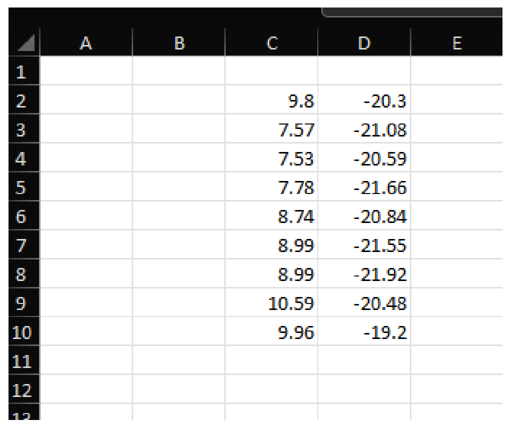
3		7.57	-21.08		
4		7.53	-20.59		
5		7.78	-21.66		
6		8.74	-20.84		
7					
8					
9					
10					
11		8.99	-21.55		
12		8.99	-21.92		
13		10.59	-20.48		
14		9.96	-19.2		
15					

(a) Sources with no data



	A	B	C	D	E
1					
2			9.8	-20.3	
3			7.57	-21.08	
4			7.53	-20.59	
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6			8.74	-20.84	
7			8.99	-21.55	
8			8.99	-21.92	
9			10.59	-20.48	
10			9.96	-19.2	
11					
12					

(b) Not in column B and C

Figure 4: Wrong data formats