

University of Groningen

Stable isotopes in stratospheric carbon monoxide

Hooghiem, Joram

DOI:
[10.33612/diss.195700524](https://doi.org/10.33612/diss.195700524)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):
Hooghiem, J. (2021). *Stable isotopes in stratospheric carbon monoxide*. University of Groningen.
<https://doi.org/10.33612/diss.195700524>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Acknowledgements

A dissertation like this is supposedly a personal achievement. Yet, it would have been impossible without the help and support of colleagues, friends, and family. At the same time, the journey towards the doctorate degree can be tough on the entire fellowship, and not only the one who bears the ring. On the next few and final pages of this dissertation I'd like to express my gratitude to all the people that contributed in one way or the other.

Huilin, I still remember the day that you encouraged me to become a PhD candidate, working with you on the AirCore project. We both got carried away during a lunch meeting about the work and planning the project. I got an email that night suggesting I write an official application, to see if we are both up for the commitment we were about to make; I had already made up my mind. Huilin, I'm very grateful for the opportunity you gave me that day. Thanks also for the guidance, education, and, most importantly, the freedom you have given me during the project. I should also thank you for the patience that you've had to have with me, whenever I was stubborn, overly critical, and a perfectionist. I can only hope that they have added to your wisdom just as much as it did to mine. Huilin, it has been a pleasure working with you, and I can only hope that our paths may cross in the future. Cheers!

I'd like to thank all the people in the atmospheric trace gas research group for their valuable support. Linda and Truls, thanks for taking me into the research group. Your help in the lab, interest, and experience have greatly eased my start. The same goes for all the great technicians that aided me during this research. Bert Kers, Marcel and Henk Been, without your expertise and ideas LISA would not have been realised, and this dissertation would not exist. Thanks for helping me, even on the shortest of notices. Marcel, thanks for joining me on my first campaign which made the first LISA flight a success. Steven, thank you for the improvements to LISA in preparation for the campaign in Traînou. Linda, Truls, Katarina, Rebecca, Alessandro, Xin, and Steven, thanks for all the suggestions during group meetings.

Collaborations are of great importance for the advancement of science. I'd like to thank all the great people at the Sodankylä Geophysical Observatory. Especially, Rigel, Pauli, Juha Hatakka, and Juha Karhu, it has been a pleasure to work with you. Thanks for launching and more over retrieving all those balloons. You have definitely made my stays in Sodankylä a wonderful experience. Elena and Thomas, thank you for helping me to do the stable isotope analyses on the stratospheric samples at IMAU. Only a couple of days, but invaluable for the main conclusions of this work. Then, Ralph, Jens-Uwe, Ines, and Sergey, thank you for performing the simulations used in this work. And to all of you, thank you for your explanations, suggestions, and help

in data interpretation.

Meis and Jelle, I've had great fun to supervise your theses. Thank you for the hard work, which has become a small but important part of this dissertation.

I can honestly say I have enjoyed every single day working on this dissertation. This is largely due to the great and nice people working at the Centre for Isotope Research. Dear "CIO'ers" thank you all for the interesting discussions, laughter, joking around, and providing a listening ear during coffee/thee/lunch breaks, but also for the helping hand that you've lent me when needed. Your presence is what creates the nice atmosphere at the Centre for Isotope Research.

Bert Scheeren, after the move to the new building, the Energy Academy, you and I became "roommates". I think we were both pleased, and we quickly went in to decorate against the rules of the interior architect. We definitely had better taste. There are so many things that I learned from all of our discussions, for which I'm grateful. We have shown mixing more experienced and senior staff members with freshmen is a good idea.

Bert Scheeren and Mike, we've had many discussions together, while enjoying a beer after work on a Friday. Those discussions certainly shaped my vision on science, and were a very welcome push in the back when needed. Additionally, these are simply great memories for which I thank you both.

Pap, mam, dank voor jullie onvoorwaardelijke steun aan alles wat ik onderneem, vanaf de dag dat ik geboren ben tot nu. Dank voor jullie niet aflatende inspanning om mij en mijn broertjes en zusjes de beste start in het leven te geven die een kind zich kan wensen (ook al besef ik me dat nu pas). Alle creativiteit, gezondheid en goed fatsoen komt van jullie. Marijn & Robert, Wisse & Mignon, Tobias en Berit, dankjewel voor al die keren dan we riddertje speelden in midden aarde, lego bouwden, met behulp van playmobile de kerstboom ont deden van all haar naalden, de kussengevechten op zolder, surfen, vakanties, gezelligheid, borrels, etentjes en alle andere fantastische dingen die we samen deden. Ik kan me geen betere familie wensen.

Mam, ook bedankt voor de prachtige etzen welke de ontwikkelingen in dit proefschrift uitbeelden. Een prachtige herinnering aan deze onderneming.

Sjoerd en Tijmen, tijdens een ietwat beschonken BBQ in een studenten huis in Groningen, werd zonder enige aarzeling besloten dat jullie paranimf zouden zijn, nog voor ik de baan officieel geaccepteerd had. Dank hiervoor en voor al jullie inspanning en moeite tijdens de voorbereiding van mijn promotie. Maar bovenal dank voor jullie vriendschap in een vriendenkring die is ontstaan op de middelbare school en een die nog steeds voortduurt. Samen met Aswin, Bart, Daniël, Irshaad, Steven Vugteveen, en Wouter, ontzettend bedankt voor alle gelegde kaartjes, drankjes, reisjes, vakanties, etentjes, pasjes, concerten en bovenal het grenzeloze geouwehoer. Ik kan me geen serieus gesprek met jullie herinneren. En dat is goed, dank hiervoor. Ook dank aan de jongens van lycurgus 7. Of voetballen bij het mooiste bierteam van de kelderklasse een positief effect heeft gehad op mijn gezondheid valt te bezien, maar het hielp zeker de gedachten te verzetten. Dank voor alle lol en mooie herinneringen.

Chantal elke dag groeit mijn liefde voor jou en ons gezin door. Thuis is waar jij bent, en een stabielere basis kan ik me niet wensen. Dankje dat ik dit traject op mijn manier mocht doen. Jij zorgde ervoor dat ik me niet alleen op mijn werk zou storten. Dankje voor alle gezelligheid en liefde. Dankje dat je me altijd hebt aangemoedigd te blijven voetballen, muziek maken, en tijd te maken voor andere leuke dingen; dat

proefschrift komt later wel, en het komt af, en zo geschiede. Lasse, lieverd, dankje dat je papa altijd aan het lachen maakt. Onze avonturen maken dat ik mezelf weer kind voel, en dan vergeet ik de uiterst complexe wereld waarin we leven, al is het maar voor even. Siem, jou komst heeft papa volhard om de race tegen de klok te winnen. Dit boek ging naar de promotores toen jij geboren werd. Dit boek is af en uit. Nu is het tijd voor ons verhaal, samen met je lieve moeder en grote broer.