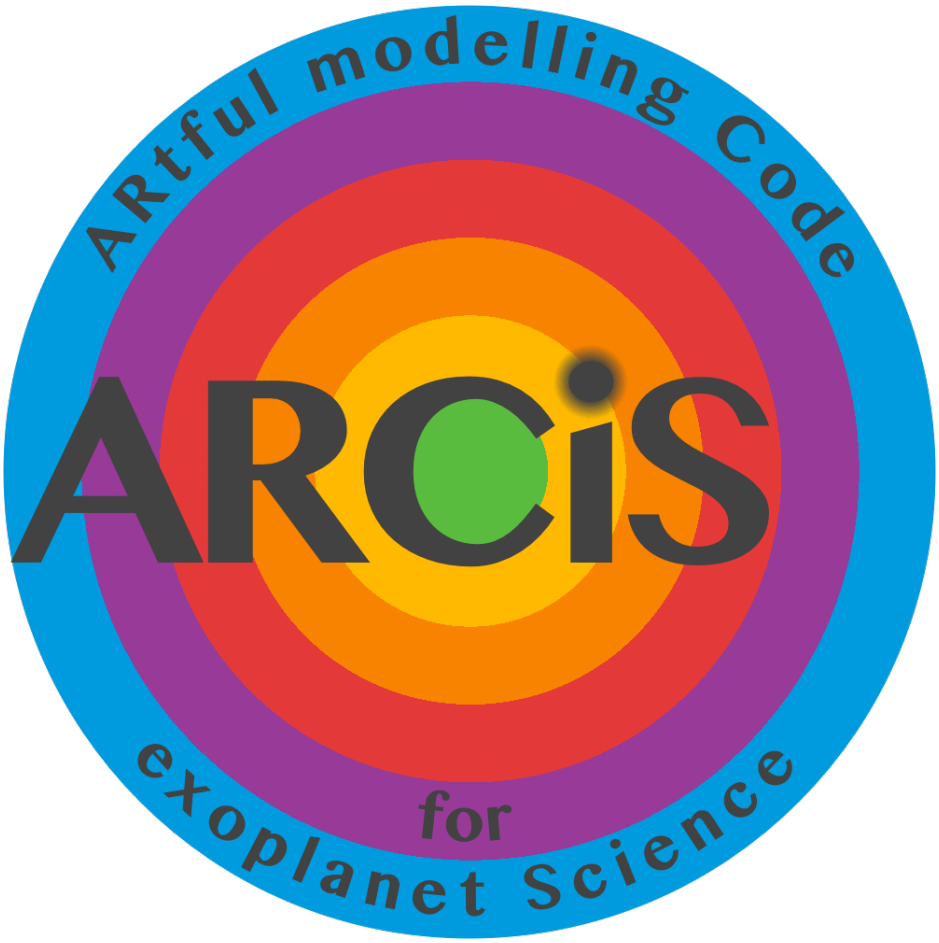

Installation on the computers of the University of Groningen

Michiel Min

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1 Introduction

1.1 Terms of use

By using ARCiS you agree to the following:

- If in doubt on any of the results, you consult with me. Email: M.Min@sron.nl
- You cite the appropriate papers listed below.

The most important reason for this is to make sure that ARCiS is used in a correct way and the result are scientifically useful. ARCiS is a complex code which can do a lot of things, this also means things can go wrong. Please refer to Min et al. [2020] for the first full description of the fundamental properties of the code.

Note that there are several parts of the code from different developers:

- Cloud formation framework: Ormel and Min [2019]
- Optical properties of cloud particles computed using DHS: Min et al. [2005], Toon and Ackerman [1981]
- Refractive indices for the cloud species, see references in Min et al. [2020]
- Molecular opacities: Chubb et al. [2021] and references therein
- Multinest Retrieval tools: Feroz and Hobson [2008], Feroz et al. [2009, 2019]
- GGchem when including chemistry: Woitke et al. [2018]
- Disequilibrium chemistry implementation: Kawashima and Min [2021]
- Diffusion implementation for 3D structures: Chubb and Min [2022]
- Coupling with planet formation parameters: Khorshid et al. [2022]

2 Installing ARCiS at the computers of Kapteyn

ARCiS is installed on the computers of Kapteyn by the computer group. The version number can be found at the top of the log file when running ARCiS. To setup your computer for running ARCiS you need to only link to the location of the Data directory. This can be done as follows:

First go to your home directory:

```
# cd
```

Next, make the ARCiS directory:

```
# mkdir ARCiS
```

Now link the data directory to the right location:

```
# cd ARCiS
# ln -s /dataserver/users/formingworlds/ARCiSData ./Data
```

Now when you want to run ARCiS, all you have to do is:

```
# module load ARCiS
```

and you are good to go!

References

K. L. Chubb and M. Min. Exoplanet Atmosphere Retrievals in 3D Using Phase Curve Data with ARCiS: Application to WASP-43b. *A&A*, 665:A2, Sept. 2022. doi: 10.1051/0004-6361/202142800.

K. L. Chubb, M. Rocchetto, S. N. Yurchenko, M. Min, I. Waldmann, J. K. Barstow, P. Mollière, A. F. Al-Refaie, M. W. Phillips, and J. Tennyson. The ExoMolOP database: Cross sections and k-tables for molecules of interest in high-temperature exoplanet atmospheres. *A&A*, 646:A21, Feb. 2021. doi: 10.1051/0004-6361/202038350.

F. Feroz and M. P. Hobson. Multimodal nested sampling: an efficient and robust alternative to Markov Chain Monte Carlo methods for astronomical data analyses. *MNRAS*, 384(2):449–463, Feb. 2008. doi: 10.1111/j.1365-2966.2007.12353.x.

F. Feroz, M. P. Hobson, and M. Bridges. MULTINEST: an efficient and robust Bayesian inference tool for cosmology and particle physics. *MNRAS*, 398(4): 1601–1614, Oct. 2009. doi: 10.1111/j.1365-2966.2009.14548.x.

F. Feroz, M. P. Hobson, E. Cameron, and A. N. Pettitt. Importance Nested Sampling and the MultiNest Algorithm. *The Open Journal of Astrophysics*, 2(1):10, Nov. 2019. doi: 10.21105/astro.1306.2144.

Y. Kawashima and M. Min. Implementation of disequilibrium chemistry to spectral retrieval code ARCiS and application to 16 exoplanet transmission spectra. Indication of disequilibrium chemistry for HD 209458b and WASP-39b. *A&A*, 656:A90, Dec. 2021. doi: 10.1051/0004-6361/202141548.

N. Khorshid, M. Min, J. M. Désert, P. Woitke, and C. Dominik. SimAb: A simple, fast, and flexible model to assess the effects of planet formation on the atmospheric composition of gas giants. *A&A*, 667:A147, Nov. 2022. doi: 10.1051/0004-6361/202141455.

M. Min, J. W. Hovenier, and A. de Koter. Modeling optical properties of cosmic dust grains using a distribution of hollow spheres. *A&A*, 432(3):909–920, Mar. 2005. doi: 10.1051/0004-6361:20041920.

M. Min, C. W. Ormel, K. Chubb, C. Helling, and Y. Kawashima. The ARCiS framework for exoplanet atmospheres. Modelling philosophy and retrieval. *A&A*, 642:A28, Oct. 2020. doi: 10.1051/0004-6361/201937377.

C. W. Ormel and M. Min. ARCiS framework for exoplanet atmospheres. The cloud transport model. *A&A*, 622:A121, Feb. 2019. doi: 10.1051/0004-6361/201833678.

O. B. Toon and T. P. Ackerman. Algorithms for the calculation of scattering by stratified spheres. *Appl. Opt.*, 20(20):3657–3660, Oct. 1981. doi: 10.1364/AO.20.003657.

P. Woitke, C. Helling, G. H. Hunter, J. D. Millard, G. E. Turner, M. Worters, J. Blecic, and J. W. Stock. Equilibrium chemistry down to 100 K. Impact of silicates and phyllosilicates on the carbon to oxygen ratio. *A&A*, 614:A1, June 2018. doi: 10.1051/0004-6361/201732193.