Magritte: a new Multidimensional Accelerated General-purpose Radiative Transfer code

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ABSTRACT

The In this paper we present the basis for a new multidimensional accelerated general-purpose radiative transfer code, called Magritte.

Key words: radiative transfer, astrochemistry, methods: numerical

1 INTRODUCTION

The Radiative Transfer problem is one of the oldest and

New C++ code based on 3D-PDR Bisbas et al. (2012) improved performance. separate modules for chemistry, radiative transfer and thermal balance.

The paper is organized as follows. In section 2 we present the computational scheme and the different modules. Section 3 describes the different benchmarks that were done to and to compare its performance with 3D-PDR.

2 COMPUTATIONAL SCHEME

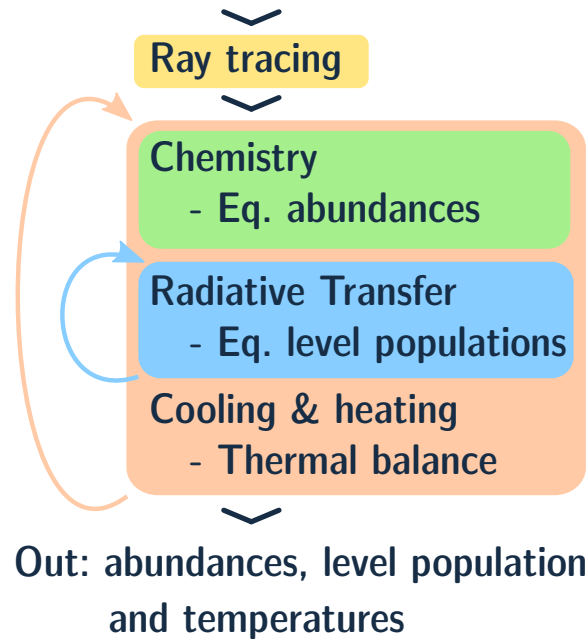Although Magritte is based on 3D-PDR, the whole code has been rewritten from scratch.

2.1 Data structures and memory layout

Magritte assumes an unstructured grid of cells

Much better memory scaling and impoved overall performance.

Plot of memory use as function of the number of grid cells, Magritte vs. 3D-PDR.

Figure 1. Scheme of different modules.

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2.2 Modules

2.2.1 Ray-tracing

2.2.2 Chemistry

2.2.3 Radiative transfer

Lines plus continuum.

Acceleration methods Ng-acceleration and Rybicki-Hummer acceleration scheme Rybicki & Hummer (1991)

Later versions will be able to treat multiple dust scattering

2.2.4 Thermal balance

Magritte can self-consitently determine the temperature assuming local thermal balance, i.e. equal heating and cooling rates for each cell. (Argument on time scales?)

2.3 Parallelization strategy

3 BENCHMARKS

4 APPLICATIONS

The modular character of Magritte

5 CONCLUSIONS

We have presented Magritte: a new multidimensional accelerated general

Once all modules are finished and extensively tested, the source code for Magritte and its separate modules will be made freely available on github.com/Magritte-code.

REFERENCES

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