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# Scaling laws for turbulent H II regions

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**ABSTRACT**

Turbulence can cause temperature fluctuations via two mechanisms in H II regions, via a direct mechanism , and by an indirect mechanism. In the direct mechanism, dissipation of the turbulent kinetic energy acts as a fluctuating heating source for the gas. In the indirect mechanism, the shocks cause density fluctuations, which modulate the ionizing flux that arrives at the outer parts of the H II region, causing the boundary to move in and out, transitioning between a recombination front and an ionization front. If the modulation timescale corresponds to the recombination timescale, then a portion of the gas is out of thermal equilibrium.

**Key words:** HII regions – ISM: kinematics and dynamics – turbulence

## 1 INTRODUCTION

## 2 SUMMARY OF GARCÍA-VÁZQUEZ ET AL. (2023)

## DATA AVAILABILITY STATEMENT

All data and accompanying analysis programs used in this paper are available from the github repository https://github.com/will-henney/turb-t2-paper.

## References

Medina S.-N., Arthur S., Henney W., Mellema G., Gazol A., 2014, MNRAS, 445, 1797

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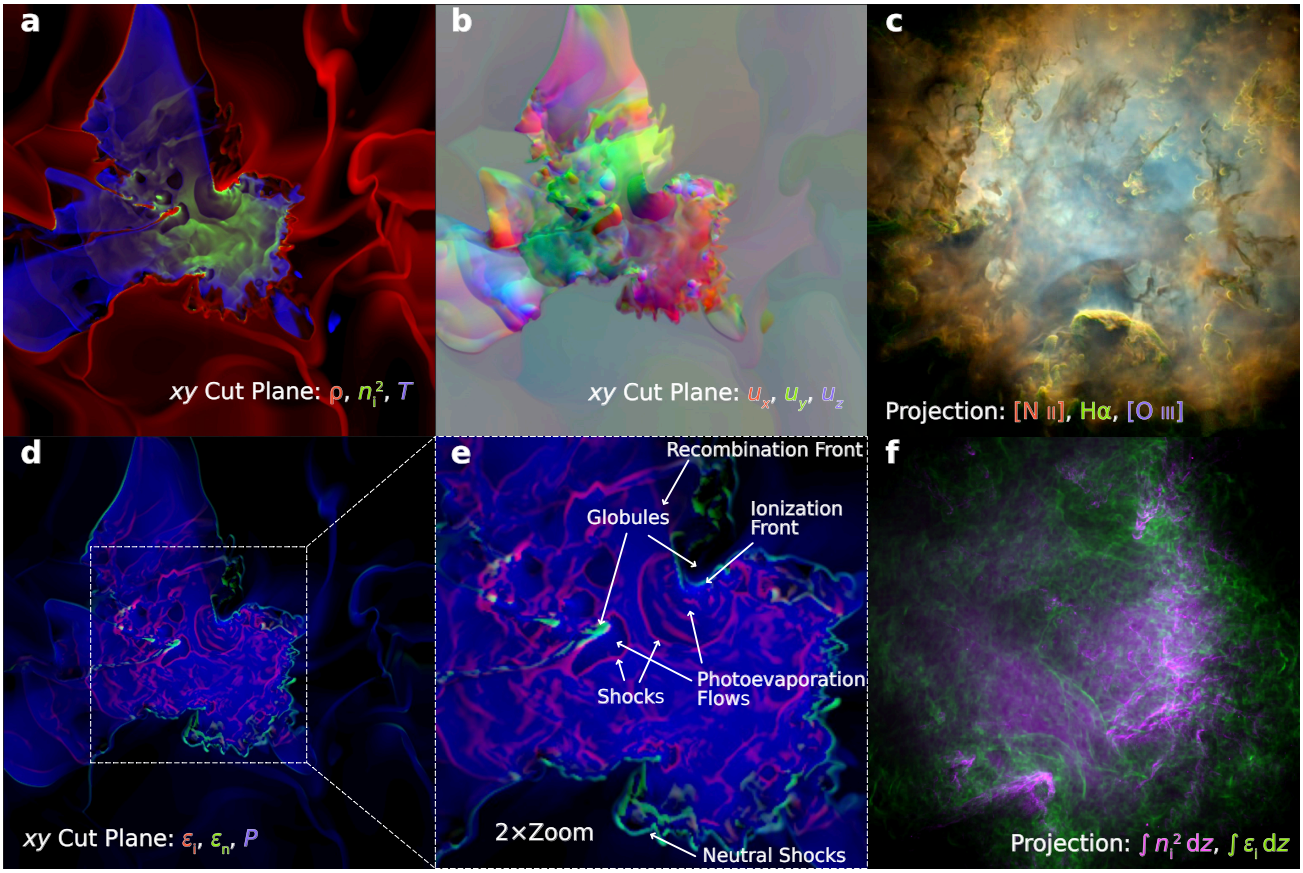


**Figure 1.** Structure of a single-star H II region from a three-dimensional radiation-hydrodynamics simulation (Medina et al. 2014). (a) Plane $xy$ cut through the fields of gas density (red), squared ionized density (green), and gas temperature (blue). (b) Vector velocity field for the same cut: red, green, blue show $u_x$, $u_y$, $u_z$, with dark colors indicating negative values and light colors positive values. Mid gray indicates zero. (c) Simulated surface brightness image of the simulation cube in 3 different optical emission lines: