

## UPDATE - 02.05.19

(I) turbulence = from simulation [cm/s]

~~also~~  $T_{\text{sim}} \rightarrow$  from simulation

$$c_s = \sqrt{\frac{K_b T_{\text{sim}}}{m_p}} \quad [\text{cm/s}]$$

$$T_{\text{min}} = 12 \text{ K}$$

$$T_{\text{max}} = 3 \times 10^8 \text{ K}$$

$$M = \text{turbulence} / c_s$$

[1]

$$M_{\text{min}} = 0.03$$

$$M_{\text{max}} = 277$$

Plotting  $\bar{X}_{\text{H2}}$  vs  $\bar{n}_{\text{H}} \rightarrow \underline{\text{Image-1}}$

(II) turbulence = from simulation [cm/s]

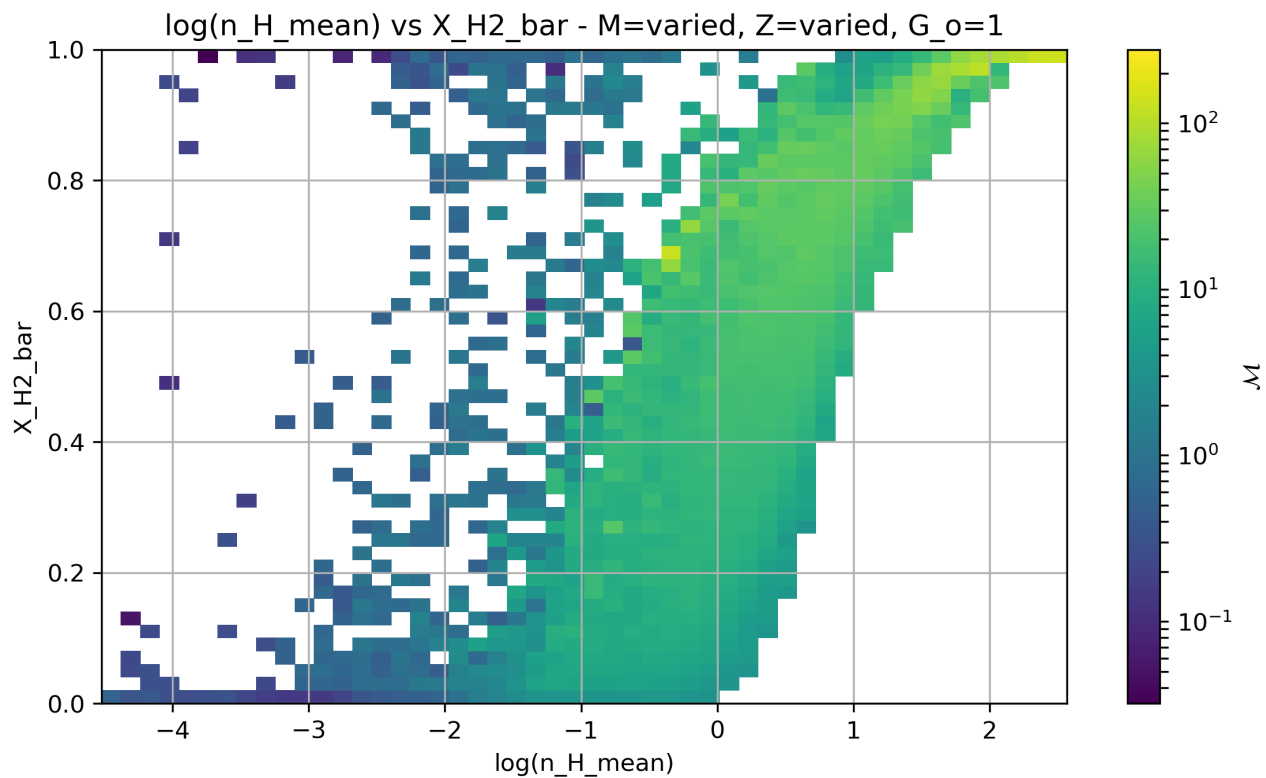
$$T_{\text{mean}} = 10 \text{ K}$$

$$c_s = \sqrt{\frac{K_b T_{\text{mean}}}{m_p}} \quad [\text{cm/s}]$$

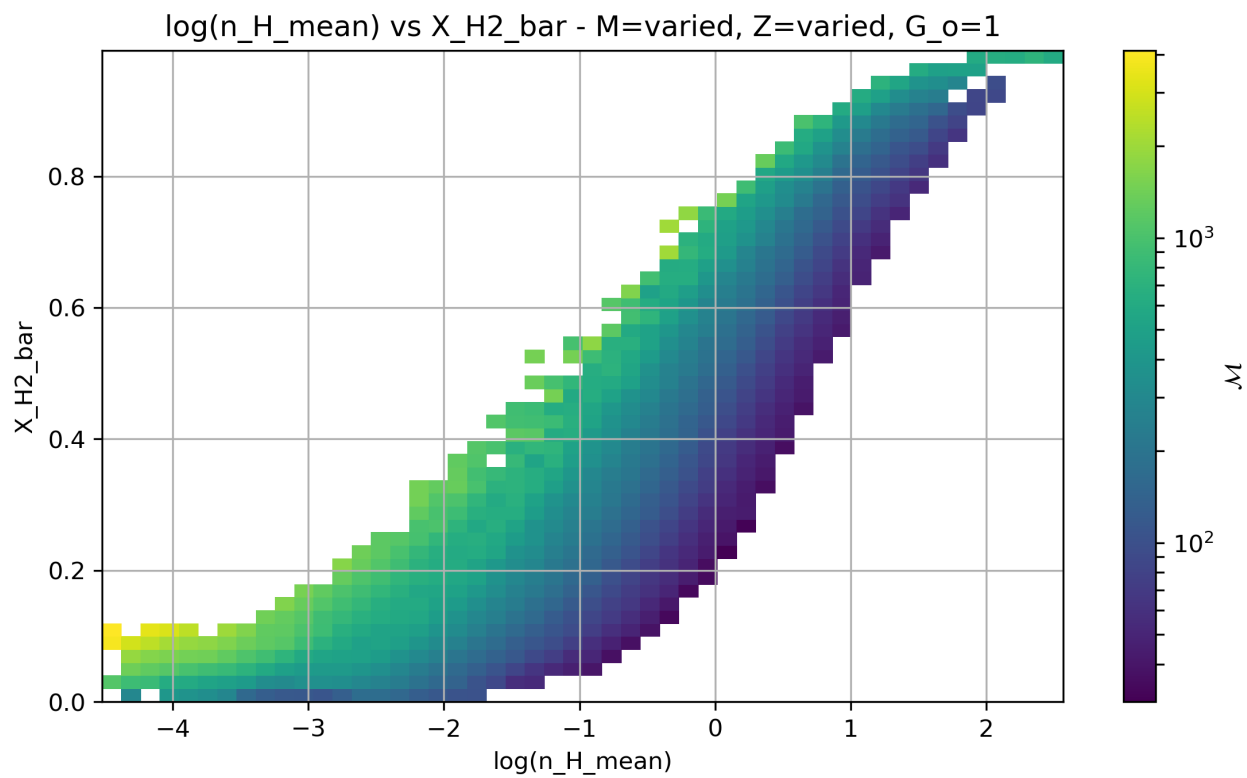
$$M = \text{turbulence} / c_s$$

Plotting  $\bar{X}_{\text{H2}}$  vs  $\bar{n}_{\text{H}} \rightarrow \underline{\text{Image-2}}$

**IMAGE-1:**



**IMAGE-2:**



So I decided to look at the outliers individually by creating a mask such that:

```
mask = X_H2_bar > 0.6 & log10(n_H_mean) < -2.0
```

And then I looked at the temperatures and mach numbers for these particular cells:

```
In [36]: mask = np.logical_and(X_H2_bar > 0.6, np.log10(n_H_mean_arr) < -2.0)
```

```
In [37]: T[mask]
```

```
Out[37]: SimArray([1.78589988e+08, 4.89726756e+07, 2.51370037e+07, 1.51918627e+07,
                  2.24117752e+07, 2.37046546e+07, 9.18790949e+06, 1.30099430e+07,
                  1.56337292e+07, 1.02275495e+07, 1.67859670e+07, 1.12160605e+07,
                  1.44759852e+07, 1.16941665e+07, 2.47290704e+07, 2.31993661e+07,
                  1.81005801e+07, 7.75930925e+06, 1.74613750e+07, 1.06309258e+07,
                  3.48923338e+07, 9.33526500e+07, 1.34873853e+07, 2.95519237e+07,
                  3.23552423e+07, 3.66285193e+07, 2.04574575e+08, 2.05672700e+08,
                  3.70840530e+08, 2.32406370e+08, 3.34804160e+08, 2.31249081e+08,
                  2.00808987e+07, 1.27958302e+07, 8.27663319e+07, 8.64570911e+06,
                  1.15557586e+07, 3.32770724e+08, 2.22667959e+08, 2.33408689e+08,
                  2.49085687e+08], 'K')
```

```
In [38]: mach_no_arr[mask]
```

```
Out[38]: array([0.11751895, 0.25526713, 0.90962939, 0.86338487, 0.59167057,
                0.69529326, 1.07954719, 1.27301591, 0.78373951, 1.27725481,
                1.1326838 , 0.9736903 , 1.20102358, 0.94218807, 0.5528871 ,
                0.70500097, 0.85827074, 1.34837166, 0.45798756, 0.65483699,
                0.17145975, 0.08944509, 0.85423797, 0.32713396, 0.17816887,
                0.14295935, 0.14092032, 0.03208115, 0.24388924, 0.20300086,
                0.0994377 , 0.19469658, 0.3533383 , 0.61407139, 0.16243859,
                0.5819171 , 0.57657044, 0.04628588, 0.12189214, 0.11676127,
                0.11475591])
```

The temperature of the outlier points is very high, and so the mach number is very low.