



# How to Give a Bad Talk

Reynier Squillace



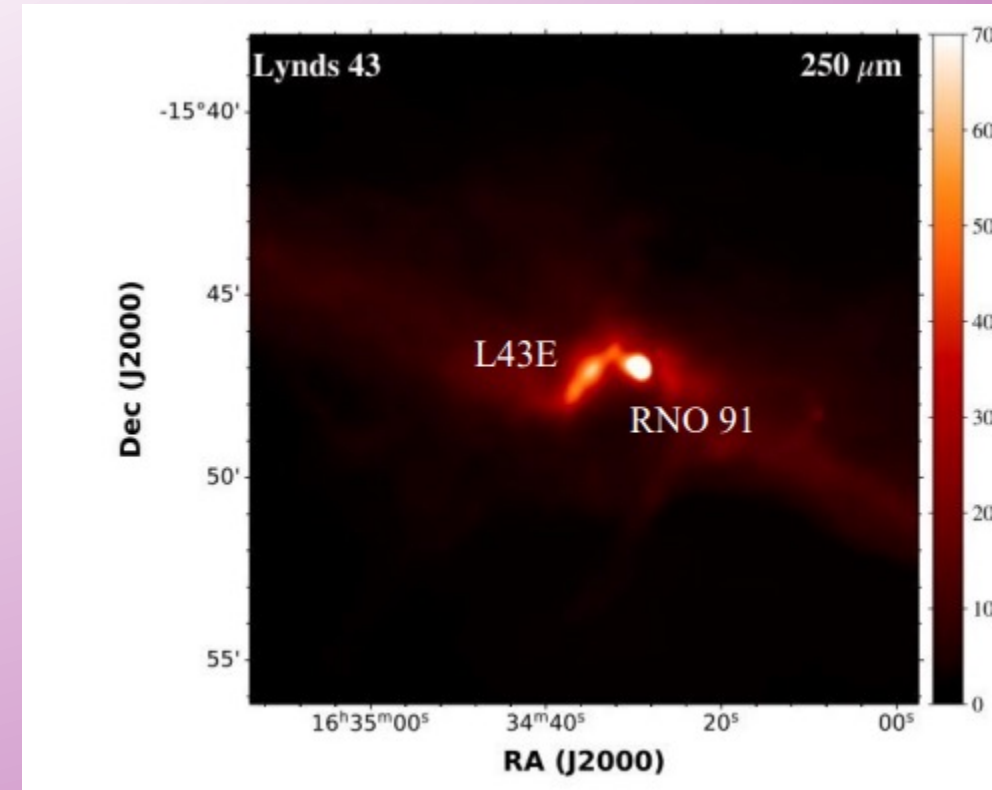
# Nitrogen fractionation in prestellar cores: is it all lies?

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# Background

- Prestellar cores:
  - Bound
  - Gravitationally?
  - **CONTROVERSIAL!**



# Nitrogen-15

- Normal nitrogen but it has 23 quarks instead of 21
- Can't observe atomic  $^{15}\text{N}$  in space because it's too low and the Dutch won't let us!!! LOFAR is the only telescope in the world with the range to do so but the Netherlands is a country with a lot of Radio Frequency Interference (RFI). Work is in progress to minimize the RFI in the region around LOFAR but wind turbine companies are intent on ruining low-frequency astronomy for all of us. Some brave astronomers are taking them to task with the Dutch government and these people deserve applause, but due to modern globalization (starting with the Silk Road developments in the 8<sup>th</sup> century CE) and technology (which has its roots in the steam revolution during the late 18<sup>th</sup> century, enabled by trans-Atlantic trade and European imperialism in Africa and Asia, particularly as it relates to rubber farming and the development of the telegraph) this is a bleak prospect because we live in a world intent on creating RFI at every turn. Consider minimizing your cellphone use, using a furnace instead of a microwave to heat your burrito lest you create a new radio transient, driving a diesel car, etc.
- Can't observe atomic  $^{14}\text{N}$  either
- Can't observe molecular nitrogen because as we all know  $\int \psi_f^* e r \psi_I = \langle d \rangle^2$
- So what is the ratio of  $^{14}\text{N}$  to  $^{15}\text{N}$ ?
- Use ammonia

# Why We Care

- Click to add text

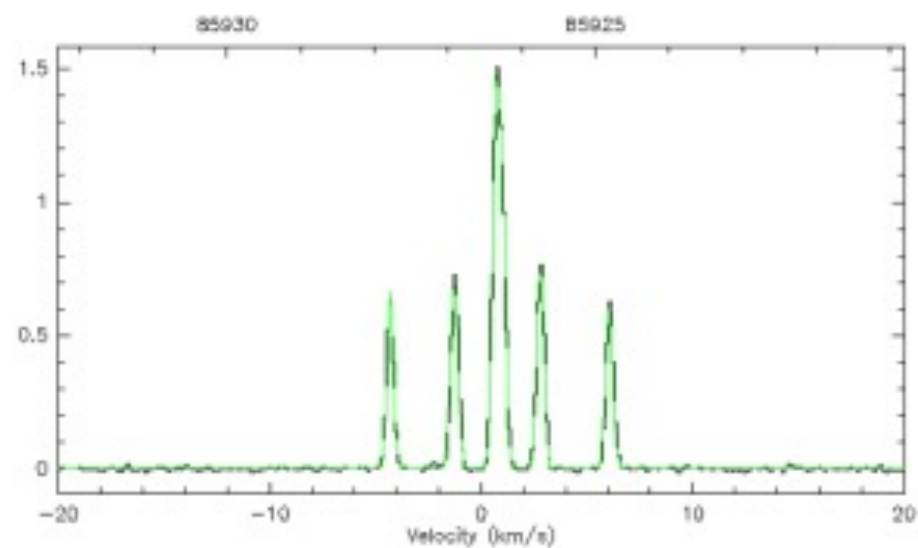


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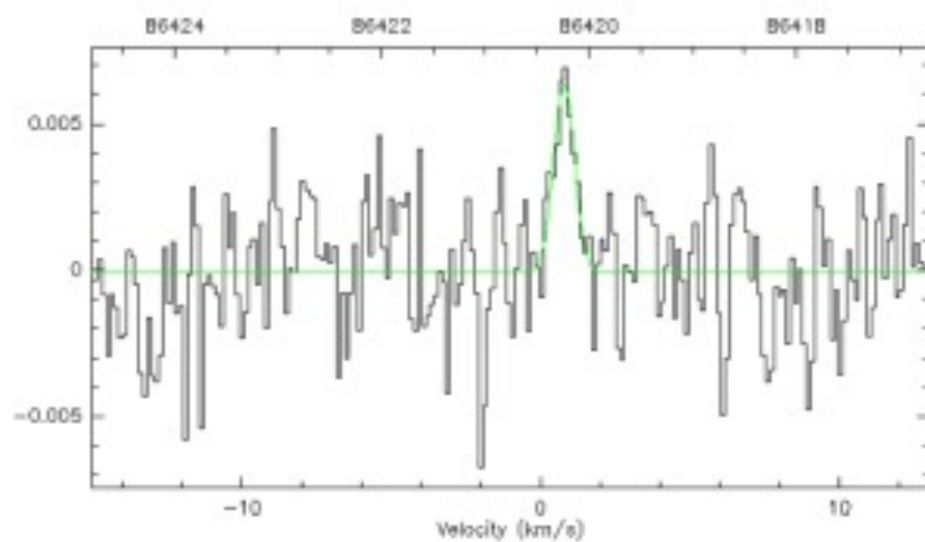
## Observations

- First disaster (bad idea)
- Preliminary successes (KPO 12m)
- Second disaster (MWM)
- Nominal success (Obs)
- Third disaster (GBT)
- Success (GBT)
- Fourth disaster (wheel)
- Fifth disaster (grad school)

## Observed hyperfine structure of $^{14}\text{NH}_2\text{D}$



## Observed emission line of $^{15}\text{NH}_2\text{D}$



# Methods

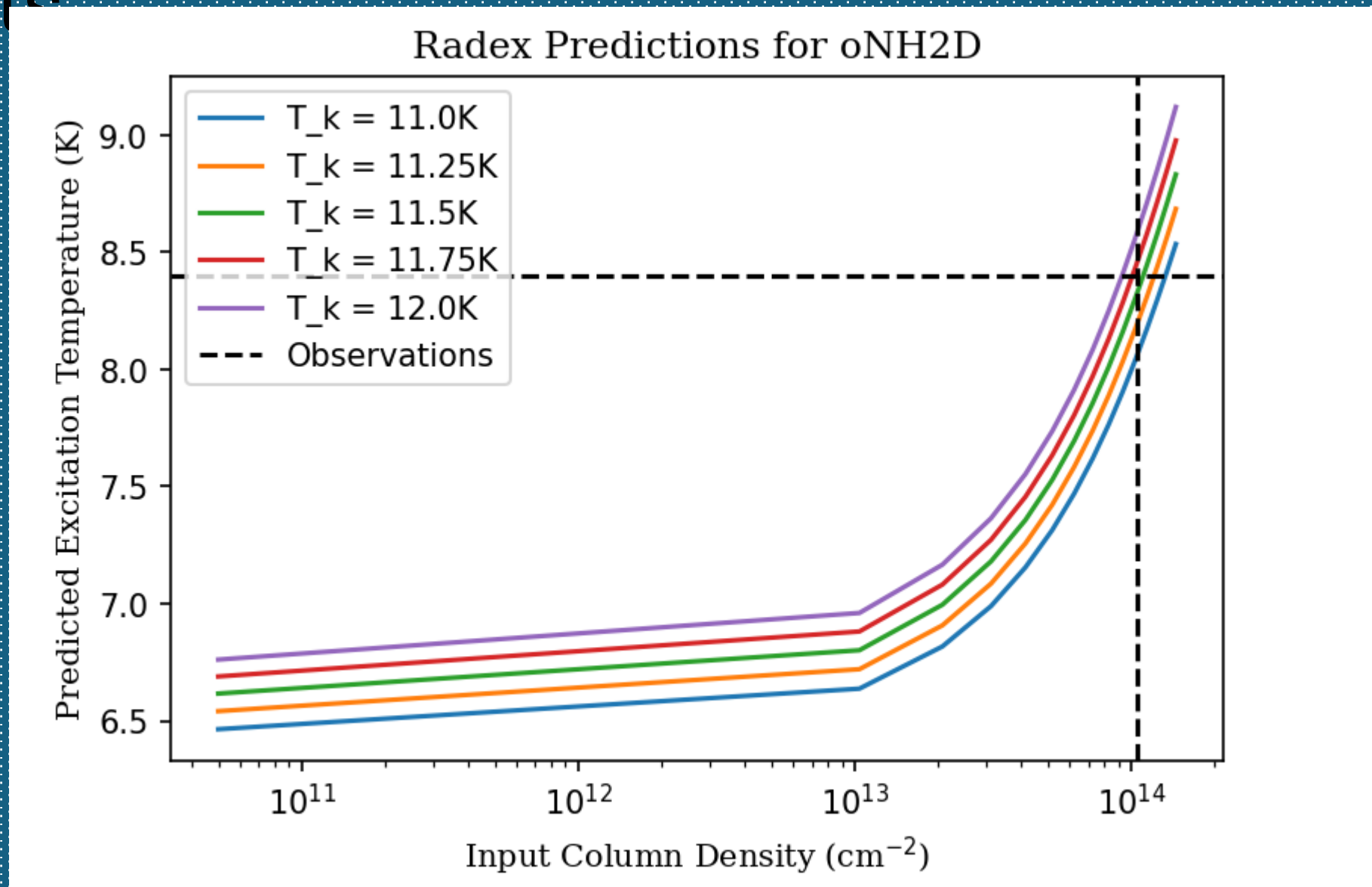
$$\tau(\nu) = \tau_M \left[ \sum_i r_i e^{-4 \ln 2 \cdot \frac{(\nu - \nu_{LSR} - \nu_i)^2}{(\Delta\nu)^2}} \right] \quad T_{ex} = \frac{h\nu/k_B}{\ln \left[ \frac{h\nu/k_B}{\frac{T_A^*}{\eta_{MBf}(1 - e^{-\tau(\nu)})} + J_\nu(T_{bg})} + 1 \right]}$$

$$N_{14} = \frac{8\pi \sqrt{\frac{\pi}{4 \ln 2}} \nu_{ul}^3 \tau_\nu \Delta\nu Q(T_{ex}) e^{\frac{E_u}{k_B T_{ex}}}}{c^3 A_{ul} g_u \frac{h\nu}{e^{\frac{h\nu}{k_B T_{ex}}} - 1}}$$

$$N_{15} = \frac{3h}{8\pi^3 S \mu^2 R_i} \frac{Q(T_{ex})}{g_J g_K g_I} \frac{e^{\frac{E_u}{k_B T_{ex}}}}{e^{\frac{h\nu}{k_B T_{ex}}} - 1} \frac{1}{J_\nu(T_{ex}) - J_\nu(T_{bg})} \frac{\int T_R}{\eta_{mbf}} d\nu$$

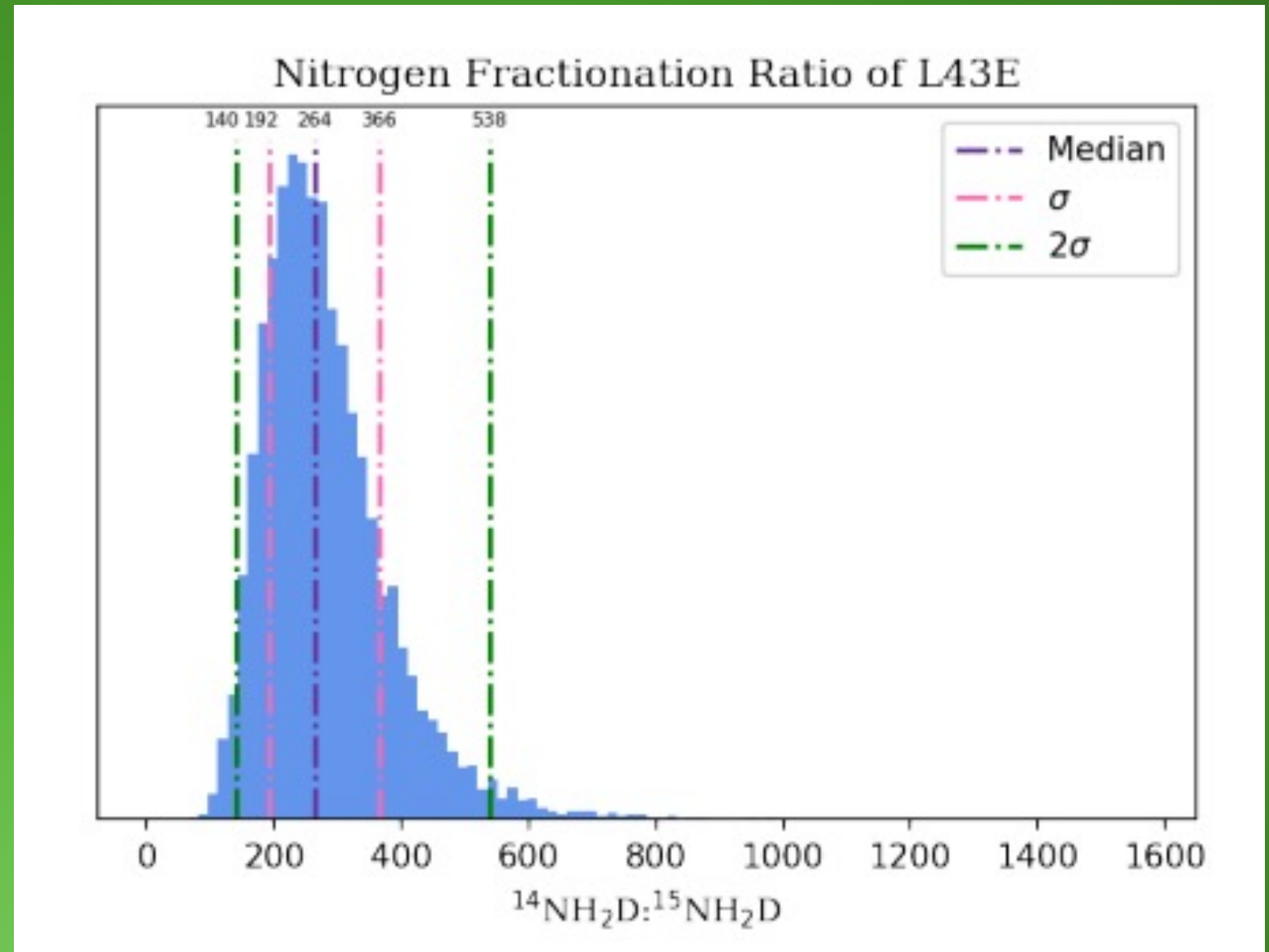


# Results



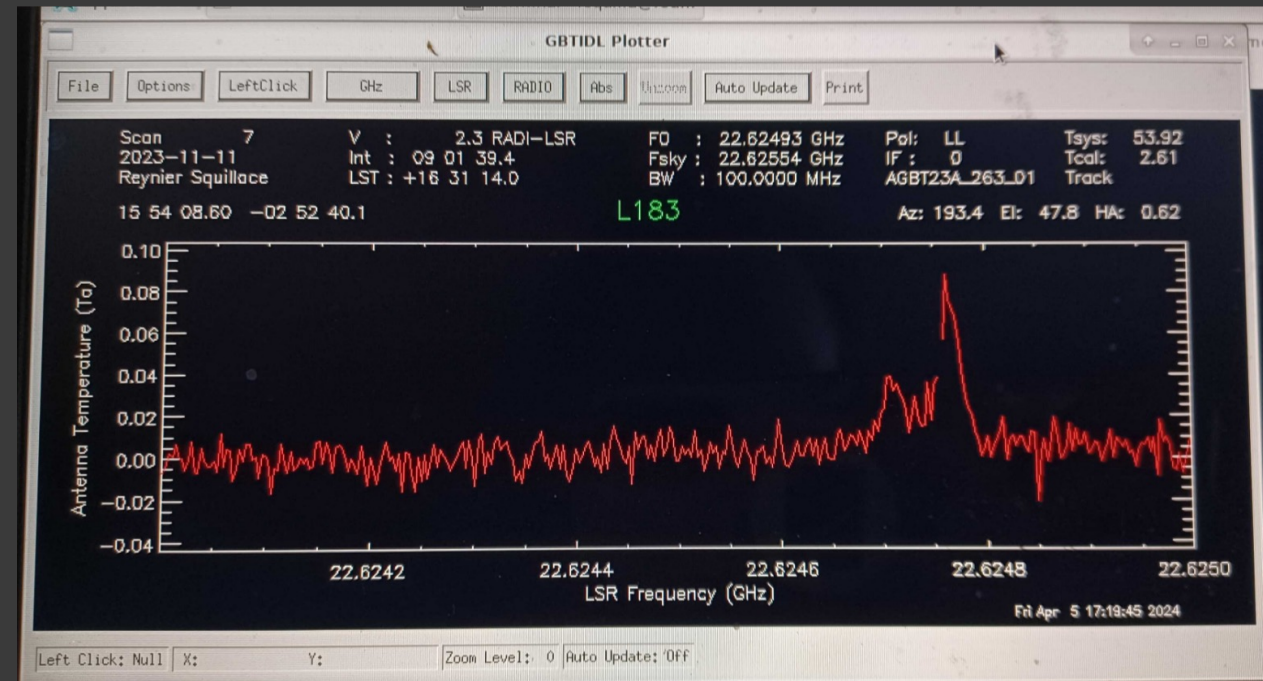
# Results

- Dorian



# Is it all lies?

- Preliminary results indicate it is all lies. This work is currently under continuation thanks to the kind support of the GBT proposal review committee, may they continue to enjoy good health, looks, marriages, etc.





# Thanks to

- Yancy
- Sam Scibelli
- Jay Frothingham
- Bob for letting me do this