성공적인 제안서 작성자의 경험 1

Something I can share about an accepted proposal

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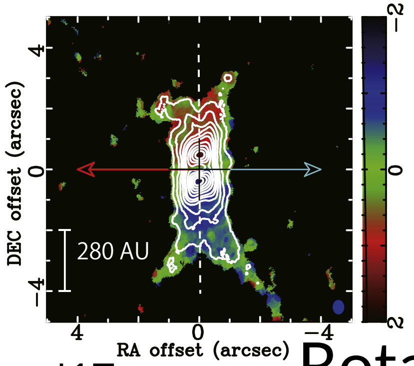
February 14, 2023

0. Outline

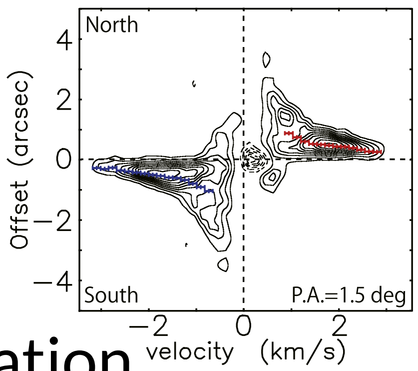
1. My scientific background
2. My proposal history
3. Motivation for the proposal picked up today
4. Original proposal
   - Contents, Figures, Review comments
5. Accepted proposal
   - New idea, Background, Previous results,
     Objectives, Settings, Fig. & Tab.
6. Review comments
   - Strengths, Weaknesses, Probability
7. Summary & Lesson

1. My Scientific Background

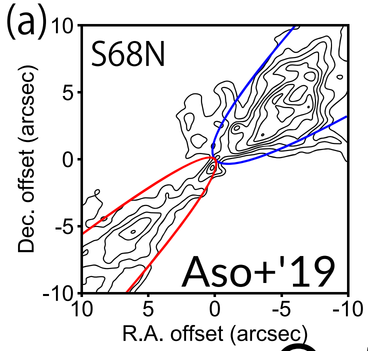
Star Formation > Protostars > Kinematics, Evolution, etc.

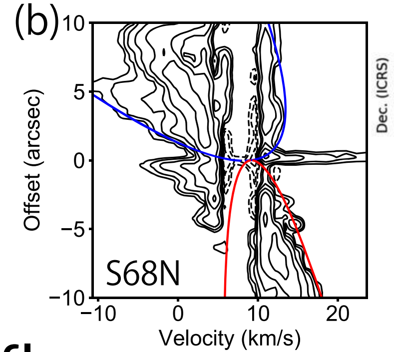


Aso+'17

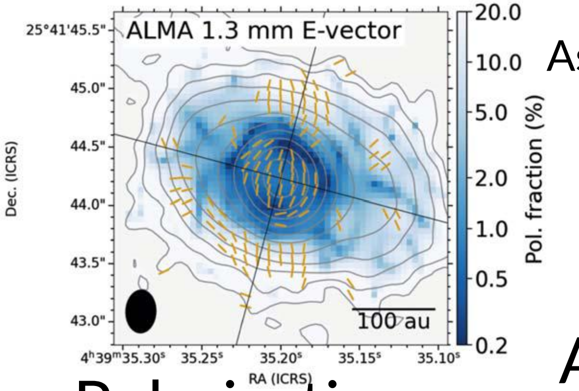


Rotation





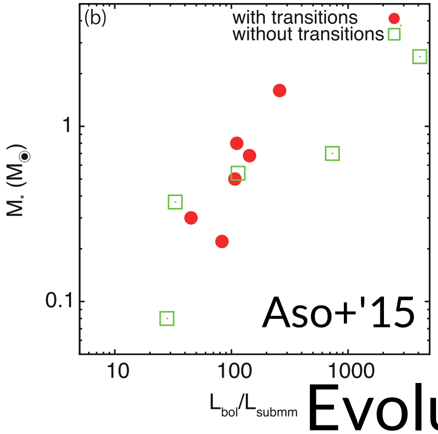
Outflow

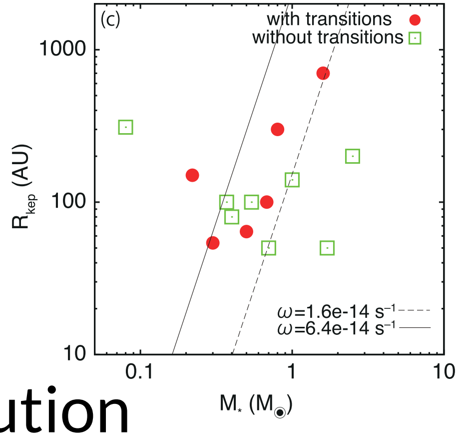


Aso+'21

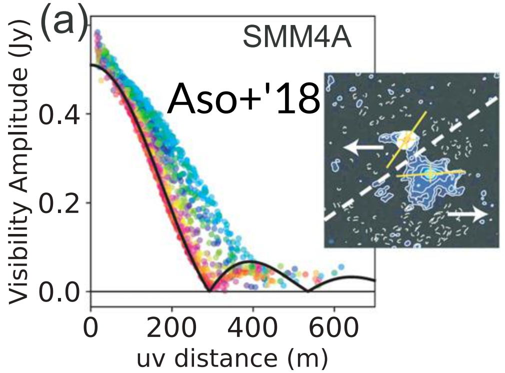
Polarization

ALMA LP



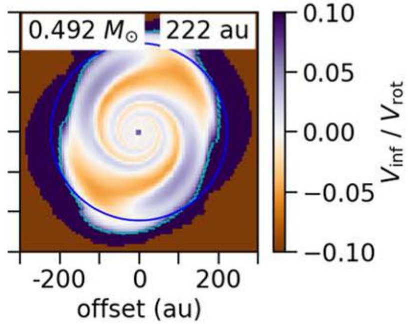


Evolution

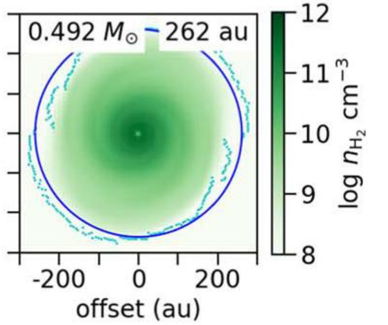


Visibility

Synthetic Obs.



Aso+'20



2. My Proposal History

Cycle3 (2015) — Taurus to Serpens[B]

← PhD

Cycle5 (2017) — Serpens follow-up

Cycle6 (2018) — Serpens follow-up, Three in Serpens, Pol. in TMC-1A (Taurus)[B]

Cycle7 (2019) — Pol. in a Serpens outflow[C], Class 0 in Serpens, Prestellar in Serpens, Compact in Serpens

Cycle8 (2021) — Prestellar in Serpens[B], Binary in Serpens, TMC-1A pol. follow-up

↓ Peer Review

← eDisk

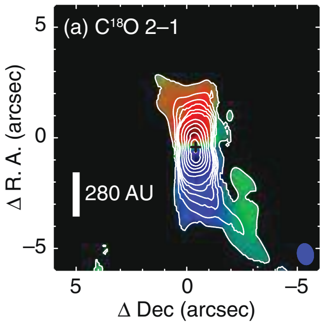
Cycle9 (2022) — TMC-1A pol. follow-up, Streamer in eDisk

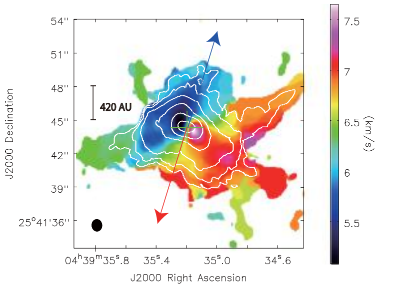
Cycle10 (2023) — TMC-1A pol. follow-up, Streamer in eDisk, Multi-band in TMC-1A

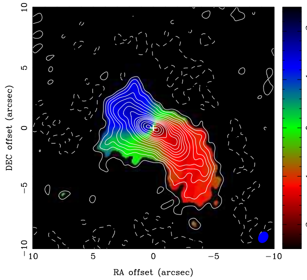
Resubmission is excluded.
[B,C]Accepted rank.

3. Motivation for the Proposal

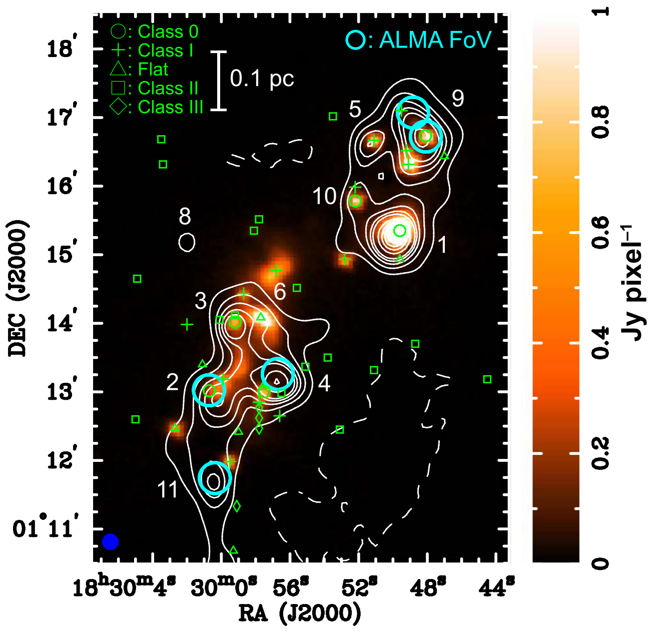
Protostars in Taurus



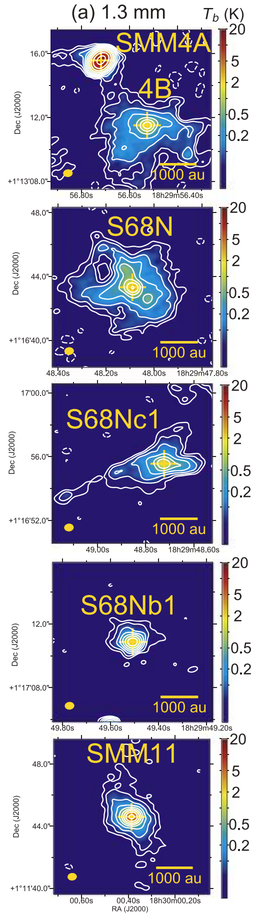




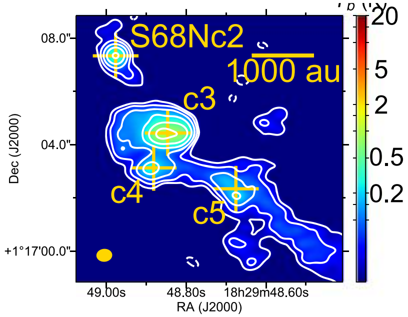
Extension to the south, young region Serpens Main



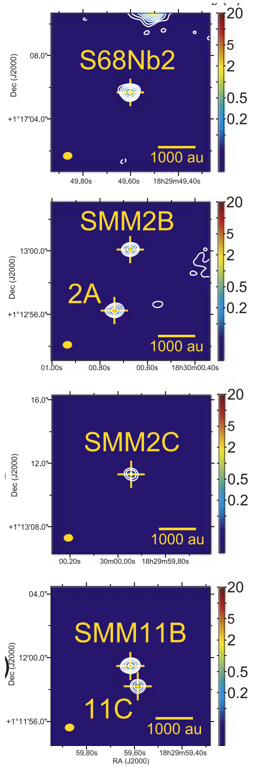
Class 0 with outflows



Starless



Compact, no outflow



Proposal for each

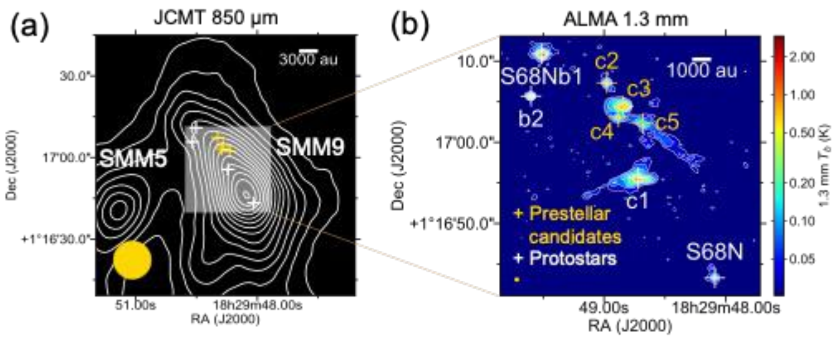
4. Original Proposal — Contents

Velocity of Prestellar Cores: Turbulence vs. Gravity

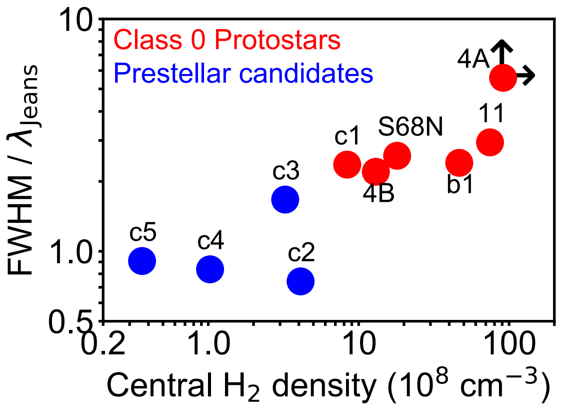
12 m x 11 hours, Band 3 (molecular lines with one setup)
Resolution ~ 0.45", MRS ~ 8".

- Two fragmentation scenarios for forming wide binary/multiple systems.
- The fragmentation occurs on <0.1 Myr. ← We identified a candidate.
- The thermo-graviational fragmentation produces sinusoidal patterns in a filament that hosts cores on the ~1000 au scale.

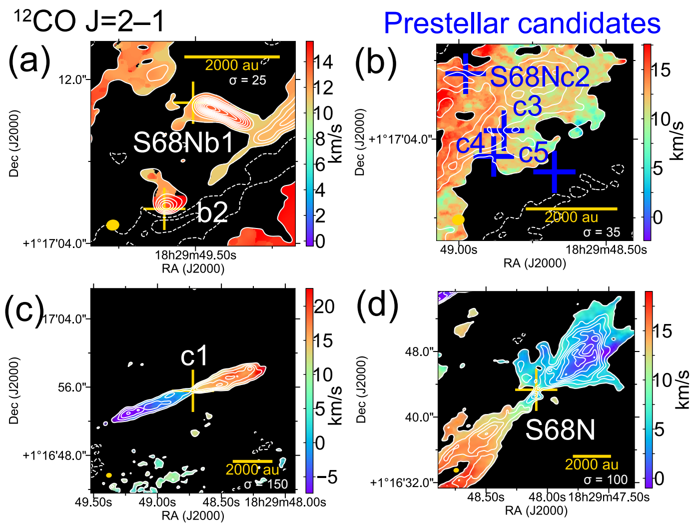
4. Original Proposal — Figures



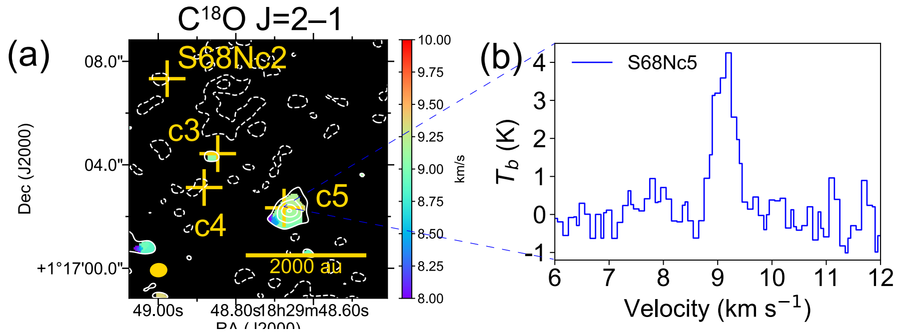
Target overview



Analysis about gravitational instability.



Difference from neighboring protostars



Low CO abundance supporting prestellar

4. Original Proposal — Review Comments

It was not the peer review yet at that time.

Strengths:

- Straightforward proposal aiming to disentangle two scenarios.
- Good characterization of pre-stellar nature in the target.

Weaknesses:

- Vague link to understandings of the whole star formation.
- The sample is likely to follow the gravity scenario. Then, the proposal should discuss other observations related to the turbulent scenario.
- Sensitivity is not enough if the cores are spatially resolved.

5. Accepted Proposal — New Idea

Dr. Changwon Lee kindly showed his interest when I presented this result at a seminar in KASI.
When discussing the result in more detail, he pointed out that their less fluxes than those of the outflowing protostars suggest very low core masses.

Then he said, *"They must be pre-Brown-Dwarf cores."*

5. Accepted Proposal – Background

Identification of New Pre-BD Cores and Study of Mass Transfer to the Cores

12 m x 17 h, Band 3 (molecular lines with two setups)
Resolution ~ 1", MRS ~ 10".

- Definition and ubiquity (importance) of brown dwarfs.
- Difficulty in forming BDs <~0.01x a typical Jeans mass.
- Scenarios that must be verified by observations toward "pre-BD": supersonic turbulent compression vs. self-gravity.
- Previous observations identified only one pre-BD.
- Thus, we aim the identification as well as the scenario verification.

5. Accepted Proposal — Previous Results

- This region is the best because of its high protostellar fraction.
- We identified four starless cores associated with a filamentary structure.

Pre-BD candidates

- Reasons why they are starless and marginally unstable.
- Their small core masses in the BD regime.

→ Need to complete the virial analysis with accurate masses.

Filamentary structure

- Velocity observed with CARMA in N_2H^+ (in ALMA Band 3) at a coarse resolution.
- $C^{18}O$ with ALMA is not detected enough.

→ Need gas motion to the cores from the neighbor protostars, filamentary structures, and the JCMT core.

5. Accepted Proposal – Objective

Propose to observe the CARMA N_2H^+ line and ^{13}CO as well as the continuum.

1. Gravitational instability by the virial analysis.
2. Mass transfer to verify whether the cores are still growing.
3. Whether turbulence (velocity dispersion) is dissipated in a core.

- Once a pre-BD core is identified (gravitational binding and little future growth) in a different region from the only one example, it is the first step for understanding BD formation without sample bias.

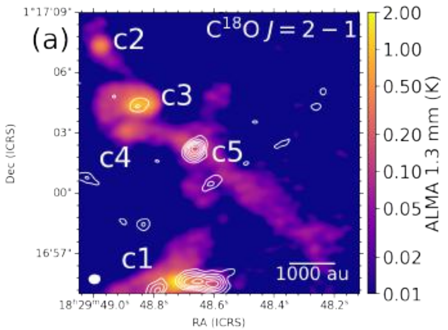
- Prediction about each bullet: e.g.,
  - With the mass and size of the cores, a sinusoidal pattern is detectable.
  - Hierarchical collapse predicts turbulence dissipation.

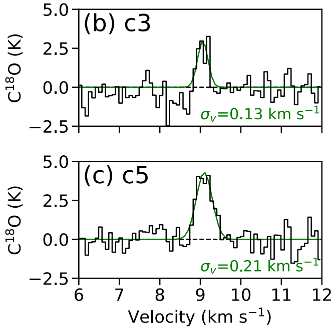
5. Accepted Proposal – Settings

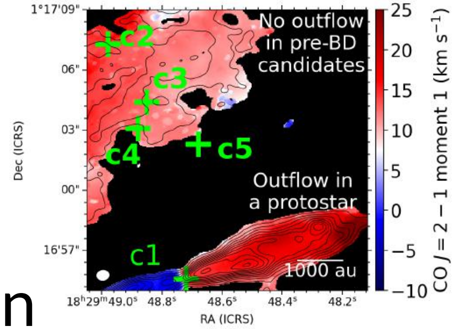
- ^{13}CO traces warm gas, while N_2H^+ traces cold gas.
- CARMA covered the ACA scale (thus we don't need ACA).
- There is also JCMT and IRAM 30-m data available.

- The requested angular resolution of ~1" can distinguish each core.
- The requested velocity resolution is the same as in the previous ALMA observation and resolved the detected $C^{18}O$ line as well as c_s.
- The requested sensitivity will detect the signal at >10σ even in the worst case.
- Only ALMA can achieve this.

5. Accepted Proposal — Figure & Table





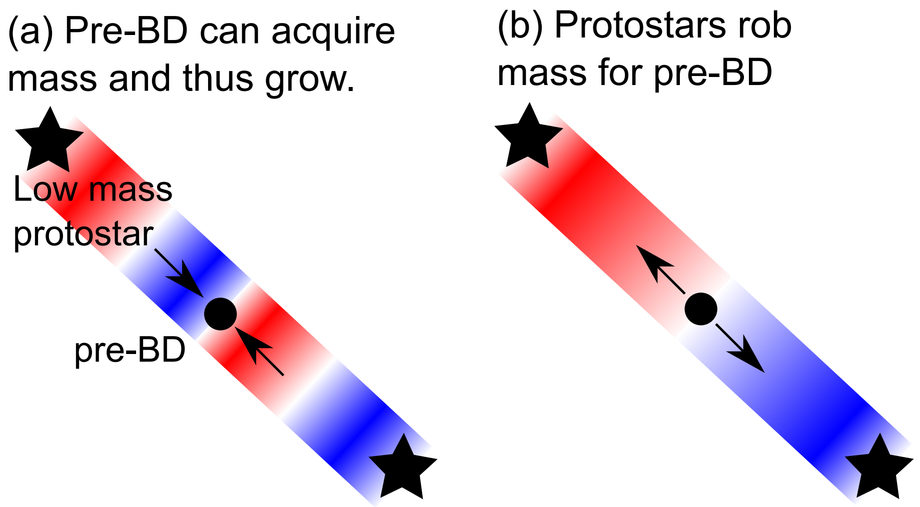


Previous results and comparison with an outflowing protostar

Table 1: The Jeans and virial analyses for the pre-BD core candidates.

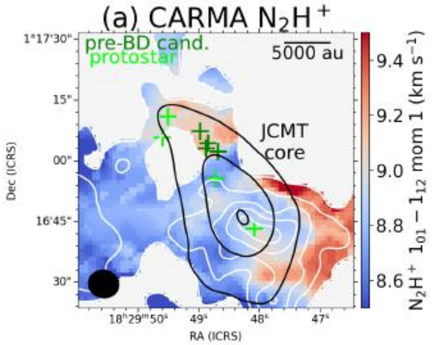
name	r (au)	$M_{\rm core}$ ($M_\odot$)	$r/\lambda_{\rm Jeans}$	$M_{\rm core}/M_{\rm vir}$
c2	160	0.04	0.7	–
c3	410	0.23	1.7	3.9
c4	360	0.05	0.8	–
c5	660	0.08	1.0	0.4

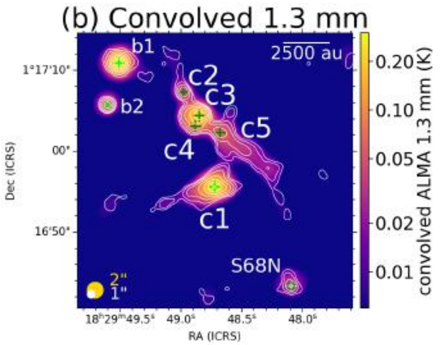
The virial analysis is not completed yet.



Schematic figure showing the growing and terminated cases.

(a) CARMA velocity
(b) 1" beam is ok





6. Review Comments – Strengths

general words
specific in my proposal

Score

1: Objectives and setup are reasonably justified.
2: Good goals, targets, and objectives.
2: The question is important for star formation. ALMA is necessary.
3: The objectives are promising.
3: BD formation is now known well. The targets are promising.

Strengths for good scores seem simple.

6. Review Comments — Strengths

general words
specific in my proposal

Score

5: Multiple scenarios are discussed.
Clear demonstration of the goal and analysis.
5: Well plan and clear goal.
5: Increasing the pre-BD sample is important.
7: N_2H^+ is a good idea. The robbery case is interesting.
8: The question seems essential.
The filament enables the supply-robbery check.

Strengths for bad scores sound more specific than for good scores.
→ Were the reviewers careful when giving a bad score?

6. Review Comments — Weaknesses

Score

1: Can distinguish various motions? The analyses are only for isolated cores.
2: Need more justification for the lower resolution.
2: Why pre-BD is important in star formation? The S/N seems borderline.
3: Other regions are ~2x closer. Not really unstable. Dust β is low.
3: CARMA is enough for the filament. The fragmentation needs a better res.

Weaknesses for good scores are actually critical but make sense.

setup including target
my science
my intention not conveyed

6. Review Comments – Weaknesses

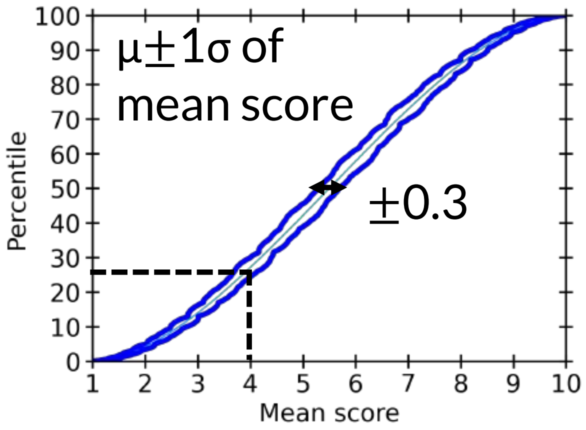
Score

5: Need the justification for the $C^{18}O$ line and 3 mm continuum.
5: Nothing.
5: IR does not put a good upper limit. All CO would be frozen out.
No outflow may be because of the crowded environment.
7: $<0.01\ M_{Jeans}$ in the background. Why a larger sample?
CO is larger and N_2H^+ is smaller than the core scale.
8: Discussion about the objectives is not well linked to the mechanisms.

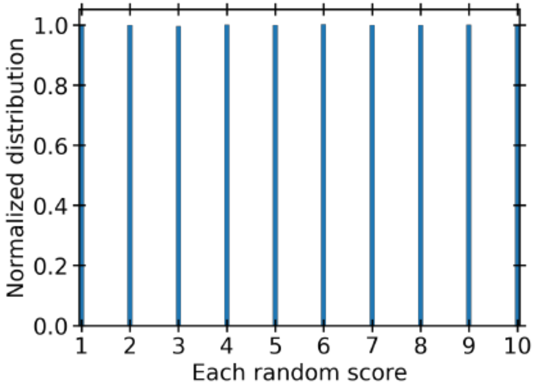
Weaknesses for the worst scores
sound to include misunderstanding.
→ The simpler, the better? Inevitable?

setup including target
my science
my intention not conveyed

6. Review Comments — Probability?



- If the proposal quality follows a normal distribution, the top quartile corresponds to score≲4.
- The uncertainty of each score is ~1. That of the mean score is ~0.3.



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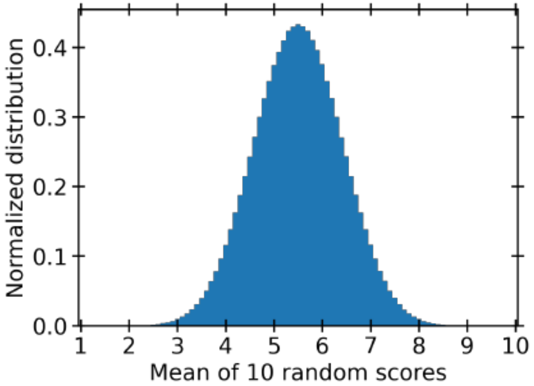

If the score is random, 70% are in [4.5, 6.5].

- Only a 6% chance that my score ≤4.1 in the random case.
- Each score ±1 could change the percentile to ±4-5.

→ Luck may not be dominant, but neither can it be ignored.

7. Summary & Lesson

- I have tried various, many proposals by extending previous studies.
- Changing the scientific topic of a proposal could raise its score even when it uses the same data.
- Good-score reviews show general strengths and scientific weaknesses.
  → The entire impression could dominate a good score.
- Bad-score reviews show specific strengths and unexpected weaknesses.
  → Misunderstanding could overwhelm specific strengths.

After Bomhyun's talk, today's last section is allocated for free group discussion about review comments. Did you look over the six review sets?