科技寫作(Scientific Writing)

Week 3 (Sept. 22 – Sept. 26)

Poster, Abstract, Oral Presentation

Abstract

Abstract
閱讀體驗決定讀者會不會想看內文

基本原則

同理目標讀者。將心比心。(請不要預設讀者人很nice)

目標讀者:

1. Apply for oral presentation: review committee members
   (i) Big conferences : People who do physics with ANY background
   (ii) Workshops : experts with the same background
2. Apply for poster presentation: nobody cares (?)
   But maybe relevant to the award committee.
3. Journal paper: experts with the same background
4. Thesis : senior experts with the same background

Abstract寫作基本原則

南朝-劉勰<文心雕龍．徵聖>

泛論君子，則云「情欲信，辭欲巧。」此修身貴文之徵也。
然則志足而言文，情信而辭巧，迺含章之玉牒，秉文之金科也。

…

…

文成規矩，思合符契。或(1)**簡言以達旨**，
或(2)博文以該情，
或(3)明理以立體，
或(4)隱義而藏用。

Abstract寫作基本原則

1. 尊重字數限制 (閱讀的人有多少時間?)
2. 並非一定要寫滿到字數限制
3. 強調科學突破、或是克服技術困難點 (閱讀的人會受什麼訊息吸引?)
4. 文法簡易，避免代名詞，少用或避免被動式敘述。
5. 避免無意義敘述
   Understanding dark matter is crucial. -> Of course. So delete this.
   I present the results of our experiment. ->
   I present the X quantity measured using the Y apparatus.
6. 定量且specific，避免ambiguous敘述
   better -> XXer by Y times

   good -> good in which aspect?

   fast/slow/big/small : X with units

Abstract寫作基本原則(對於無背景讀者)

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7. Avoid jargon (不要讓讀者自己去google才能看懂)
   看不懂全等沒寫

Abstract寫作基本原則(對於同背景讀者)

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   fast/slow/big/small : X with units
7. 直指核心

Abstract内容

1. Background/context (optional)
2. Question/problem What is your question = What question is resolved
3. Approach/development How did/could you make it? Is it convincing/promising?
4. Result
5. Implication/conclusion Why it matters to other colleagues?

Abstract内容 (BAD)

We are curious about what will be the X property of the sample Y prepared in the Z way. Why the reader should care about this? Why it is important?

We performed XXX experiment and measured YYY.
We found ZZZ. So what?

Abstract内容(conference, as invited speaker)

Title: A dry path of planet formation?

Abstract:
To fully understand how planets are formed, we need to explain the presence of water and carbon-deficient planets like Earth and Mars, as well as icy giants like Neptune and Uranus. context

This requires understanding how water-ice-coated and water-ice-free dust grains grow. The observational constraints on the latter have been sparse due to the small scales (sub-au) involved. problem

Fortunately, in the FU Orionis type accretion outburst YSOs, the water snowlines can be enlarged to comparably larger than 10 au radii thanks to the viscous heating, which opens a new window for studying dry dust coagulation. Approach

Our case study on FU Ori suggests that water-ice-free dust may be stickier than previously thought, with a lower limit of fragmentation velocity estimated at 10 m/s, which is higher than previously assumed by one order of magnitude. Result

The sticky dry dust may be prone to form planetesimal and rocky planets in situ, which could help explain the origins of the water and carbon-deficient planets and the asteroid belt in the inner Solar System. Implication

Abstract内容(paper)

- Title: The Anomalously Low (Sub)Millimeter Spectral Indices of Some Protoplanetary Disks May Be Explained By Dust Self-scattering

Previous (sub)millimeter observations have found that the spectral indices of dust emission from some young stellar objects are lower than that of the blackbody emission in the Rayleigh-Jeans limit (i.e., 2.0). Context

In particular, the recent Atacama Large Millimeter Array observations have spatially resolved that the innermost regions of the protoplanetary disks TW Hya and HD 163296 present anomalously low (i.e., <2.0) millimeter spectral indices. In some previous works, such anomalously low millimeter spectral indices were considered unphysical and were attributed to measurement errors. Problem

The present work clarifies that if the albedo is high and is increasing with frequency, it is possible to reproduce such anomalously low spectral indices when the emission source is optically thick. Approach

In addition, to yield lower than 2.0 spectral index at (sub)millimeter bands, the required dust maximum grain size a_{max} is on the order of 10-100 μm, which is consistent with the previously derived a_{max} values based on multiwavelength dust polarimetric observations. Result

In light of this, measuring the Stokes I spectral index may also serve as an auxiliary approach for assessing whether the observed dust polarization is mainly due to dust scattering or to the aligned dust grains. Implication

Abstract內容(colloquium, 北京大學)

- a. Title (in English and Chinese):
  Initial condition for terrestrial planet-formation
  (關於類地行星形成之初始條件之新猜想)
- b. Abstract
  I have been hypothesizing that, in the protoplanetary disks, the dust masses might have been systematically underestimated by at least one order of magnitude, while the dust maximum grain sizes have been systematically overestimated by 2~3 orders of magnitude. Problem
  I will present a few high angular resolution case studies to support this hypothesis, and also our new systematic surveys that imply that our hypothesis is generally true. Results
  I will also introduce the physical implications of our hypotheses.

Abstract内容(paper)

Title: SMA 200–400 GHz Survey for Dust Properties in the Icy Class II Disks in the Taurus Molecular Cloud

We present a new Submillimeter Array survey of 47 Class II sources in the Taurus–Auriga region. Our observations made 12 independent samples of flux densities over the 200–400 GHz frequency range. We tightly constrained the spectral indices of most sources to a narrow range of 2.0 ± 0.2; only a handful of spatially resolved (e.g., diameter >250 au) disks present larger spectral indices.

The simplest interpretation for this result is that the (sub)millimeter luminosities of all of the observed target sources are dominated by very optically thick (e.g., $\tau \gtrsim 5$) dust thermal emission. Some previous works that were based on the optically thin assumption thus might have underestimated optical depths by at least 1 order of magnitude. Assuming DSHARP dust opacities, this corresponds to underestimates of dust masses by a similar factor. For our specific selected sample, the lower limits of dust masses implied by the optically thick interpretation are 1–3 times higher than those previous estimates that were made based on the optically thin assumption. Moreover, some population synthesis models show that, to explain the observed, narrowly distributed spectral indices, the disks in our selected sample need to have very similar dust temperatures (T_{dust}). Given a specific assumption of median T_{dust}, the maximum grain sizes ( ) can also be constrained, which is a few times smaller than 0.1 mm for $T_{dust} \sim 100$ K and a few millimeters for $T_{dust} \sim 24$ K.

The results may indicate that dust grain growth outside the water snow line is limited by the bouncing/fragmentation barriers. This is consistent with the recent laboratory experiments, which indicated that the coagulation of water-ice-coated dust is not efficient, and the water-ice-free dust is stickier and thus can coagulate more efficiently. In the Class II disks, the dust mass budget outside of the water snow line may be largely retained instead of being mostly consumed by planet formation. While Class II disks still possess sufficient dust masses to feed planet formation at a later time, it is unknown whether or not dust coagulation and planet formation can be efficient or natural outside of the water snow line.

Abstract内容(PPVII conference)

Title: Constraining dust grain growth in Class II protoplanetary disks by the (sub)millimeter broadband Taurus-Auriga survey

Here we present a survey with an unprecedentedly densely sampled 200-400 GHz SED towards a sample of 47 Class II disks in the Taurus-Auriga region.

We highlight that these new observations tightly constrained the spectral indices of most sources to a very narrow region of 2.0±0.2, except that a handful of spatially resolved extended disks present rather high spectral indices.

Our natural, tentative interpretation for the uniform, low spectral indices is that the optically thick disk (sub)structures dominate the (sub)millimeter flux densities. Some sources are robustly resolved with <2.0 spectral indices, indicating that the self-scattering of the 100 μm sized dust can be prominent.

The result may thus provide implications for the timescale of grain growth and stickiness of icy dust.

To tighten the constraints on a_{max}, we will couple the radiative transfer modeling of the data with MCMC. In addition, we have acquired 21 hours' of follow-up JVLA observations (22B-033, PI: Chia-Ying Chung), which can constrain the dust mass budget in the optically thin regime. We welcome suggestions for the interpretation of our results and are open to collaboration.

Poster

Poster

一般情形，沒有任何與會者會先看Abstract。Poster與現場講解的整體感覺決定讀著會不會深究內容。

Poster基本原則

- 1. 分主客體
  (i) The most eye-catching result
  (ii) The most important result
  (iii) Other details in case someone needs it.
- 2. You got no more than 5 minutes. Don’t be texty.
- 3. Do I need an abstract?
  Yes if you think people won’t read the booklet.
  No if people will read the booklet before coming to your poster.
  No if nobody will read the abstract anyway.
- 4. Abstract is not Conclusion. Do I need a conclusion section???

Poster基本原則

- 1. 為口頭介紹做準備
  口頭圍繞主體介紹。主體的訊息量約3 mins純介紹
- 2. Some figures for quick Q&A
- 3. Defers deeper questions to independent discussion

Poster基本原則

- 1. Figures should have very high quality. One good figure is worths 1 million words. Label sizes are VERY IMPORTANT. Try to be color-blind friendly if possible.
- 2. Layout should be clear and LOGICAL?
  讀者必須要能自然找到閱讀順序，不能在版面中跳來跳去
  大或搶眼的內容天然地會成為第一閱讀目標。
- 3. A poster is not a paper
  電影海報、電影預告片不等於整部電影
  把握重點

Oral Presentation