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THE DISKIONARY: A GLOSSARY OF TERMS COMMONLY USED FOR DISKS AND RELATED OBJECTS, FIRST EDITION

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ABSTRACT

Based on our discussions for a panel discussion, we provide some definitions of common usage of terms describing disks and related objects.

Subject headings:

1. INTRODUCTION

The authors were members of a panel leading a discussion at the meeting, "New Light on Young Stars: Spitzer's View of Circumstellar Disks", which was held in Pasadena, California in 2008, October 26-30. The motivation for the panel discussion was a proliferation of terms related to new discoveries by Spitzer. The high sensitivity and spectral capabilities of Spitzer have allowed many more disks to be found and studied in detail, revealing new kinds of rare objects. Different groups have adopted a variety of names for these new objects. The panel attempted to collect and clarify the meanings of these terms.

The contents of this document are based on our discussions in teleconferences and emails before the meeting and on comments received from audience members during and after the meeting. As our discussion proceeded prior to the meeting, we discovered that we often had very different conceptions of what various terms meant. Rather than argue about who was correct, we instead tried to sharpen and clarify the various definitions that were in use by panel members. Then we added other terms that we knew to be used by others.

We want to make clear at the outset what this document is **not**. We do **not** attempt to reject or exclude any common usages in favor of others; we merely record them. In some cases, we **do** comment on usages or names that we found problematic, but we still include those as definitions. Consequently, this clearly has the form of a dictionary, not a document of "permitted" and "forbidden" usage. Since the focus was on disks, we adopted the title of "diskionary", which is easier to write than to pronounce.

We take our model from Webster, as in
car

1. a vehicle moving on wheels.
2. a vehicle adapted to the rails of a railroad or street railway
3. an automobile
4. (archaic) carriage, cart, chariot

which illustrates that some definitions are more general and some are specific subsets of the general definition.

In some cases, we include "descriptions" which are not part of the definition (i.e., necessary conditions), but which may describe many members of the class. Some terms also have comments that capture some of our discussions. Sometimes we have been able to supply references to the places where the definition originated or was explained. We attempted to clarify whether the term was observational, usually referring to some aspect of SED, etc., or physical, referring to an actual physical structure. However, many of these definitions still mix these two categories. The initials of the person who originally supplied the definition follow each term, but many iterations by various co-authors have occurred. The definitions are not in alphabetical order, but instead we group together related terms. We begin with definitions that address SED classes, evolutionary stages, and types of stars, as these may be used in the disk definitions.

2. THE DISKIONARY

Class 0 (NJE)

1. Observational, based on the SED properties, specifically $T_{bol} < 70$ K (Chen et al. 1995, ApJ, 445, 377)
2. Observational, based on the SED properties, specifically $L_{smm} > 0.005\ L_{bol}$. (Andre et al. 1993)
3. (Original) Observational, a source that satisifies three criteria providing indirect evidence of a central YSO in a centrally peaked submillimeter core, with definition 2 also satisfied. (Andre et al. 2000, PPIV, 59) The conditions are: (a) Indirect evidence for a central YSO, as indicated by, e.g., the

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detection of a compact centimeter radio continuum source, a collimated CO outflow, or an internal heating source; (b) Centrally peaked but extended submillimeter continuum emission tracing the presence of a spheroidal circumstellar dust envelope (as opposed to just a disk); (c) High ratio of submillimeter to bolometric luminosity, suggesting that the envelope mass exceeds the central stellar mass: $L_{smm}/L_{bol} > 0.5\%$, where L_{smm} is measured longward of 350 μm. In practice, this often means an SED resembling a single-temperature blackbody at $T \sim 15-30$K.

Comment: The original definition emphasized **indirect** evidence for a central luminosity source, but most Class 0 sources can be seen in the mid-infrared with Spitzer sensitivity, thereby providing **direct** evidence and obviating the need for some of the indirect evidence.

Class I (NJE)

1. Observational, based on the SED properties, specifically $\alpha \geq 0.3$, but $T_{bol} \geq 70$ K. (α is slope of νS_ν between NIR and MIR, originally 2 and 20 μm). (Lada 1987, IAU 115, 1, as modified by Chen et al. 1995)

2. Observational, based on the SED properties, specifically $\alpha \geq 0.3$ with no constraint on T_{bol}. (Greene et al. 1994, ApJ, 434, 614)

3. Observational, based on the SED properties, specifically $\alpha > 0$ (used when "Flat" is omitted from the system) (Lada 1987)

4. Physical, an object whose emission is dominated by the envelope (Lada 1987)

Flat SED (NJE)

1. Observational, based on the SED properties, specifically $-0.3 \leq \alpha < 0.3$. (α is slope of νS_ν between NIR and MIR, originally 2 and 20 μm). (Greene et al. 1994)

2. Observational, based on the SED properties, specifically $350 < T_{bol} < 950$ K, or $500 < T_{bol} < 1450$ K if fluxes corrected for extinction (Evans et al. 2009, ApJS, in press)

3. Physical, an object whose emission is composite, arising from both a disk, and an envelope; envelope likely possesses a wind-carved cavity.

Class II (NJE)

1. Observational, based on the SED properties, specifically $-1.6 \leq \alpha < -0.3$. (α is slope of νS_ν between NIR and MIR, originally 2 and 20 μm). (Greene et al. 1994)

2. Observational, based on the SED properties, specifically $-2 \leq \alpha \leq 0$. (α is slope of νS_ν between NIR and MIR, originally 2 and 20 μm). (Lada 1987) (used when "Flat" is omitted from system)

3. Physical, an object whose emission is dominated by the star and disk (Lada 1987)

4. Physical, a star surrounded by an accretion disk

Class III (NJE)

1. Observational, based on the SED properties, specifically $\alpha < -1.6$. (α is slope of νS_ν between NIR and MIR, originally 2 and 20 μm). (Green et al. 1994)

2. Observational, based on the SED properties, specifically $\alpha \leq -2$. (α is slope of νS_ν between NIR and MIR, originally 2 and 20 μm). (Lada 1987)

3. Physical, an object whose emission is dominated by the star. (Lada 1987)

   Description: A pre-main sequence star exhibiting no evidence for a primordial/accretion disk but which may have a small fractional infrared excess arising from a remnant primordial/quiescent or secondary/debris disk.

Stage 0 (NJE)

1. Physical, mass in envelope exceeds mass in disk plus star (based on physical version of Class 0 definition by Andre et al.)

Description: Class 0 sources are often, but not always, Stage 0 sources.
Stage I (NJE)

1. Physical, mass infall rate over mass in envelope at least 10^{-6} per year (includes Stage 0) (Robitaille et al. 2006, ApJS, 167, 256)

2. Physical, mass in envelope less than mass in star plus disk, but greater than 0.1 $M_\odot$. (Crapsi et al. 2008, Astr. Ap., 486, 245)

Description: Class I sources are often, but not always, Stage I sources.
Comments: These definitions, whether by mass or by relative infall rate may have problems in describing more massive stars.
Stage II (NJE)

1. Physical, A young star or protostar with less than 0.1 $M_\odot$ remaining in an envelope, but with a primordial disk

2. Physical, mass infall rate over mass in envelope $< 10^{-6}$ per year and $M_{disk}/M_* > 10^{-6}$ (Robitaille et al. 2006, ApJS, 167, 256)

Description: Class II sources are often, but not always, Stage II sources.
Comments: Again, there may be issues for more massive stars. Perhaps one could generalize by requiring an envelope mass $\leq 0.1(M_* + M_{disk})$.
Stage III (NJE)

1. Physical, a young star without a primordial disk

2. Physical, mass infall rate over mass in envelope $< 10^{-6}$ per year and $M_{disk}/M_* < 10^{-6}$ (Robitaille et al. 2006, ApJS, 167, 256)

Description: Class III sources are often, but not always, Stage III sources.
Comments: Again, there may be issues for more massive stars. The committee is divided on whether to say "accretion" rather than "primordial" in definition #1.
Group I (LH)

1. Observational definition, albeit interpreted via theoretical models, pertaining to Herbig Ae/Be stars with SEDs that are loosely consistent with geometrically flat, optically thick accretion disks but having small inner gaps or holes (Hillenbrand et al. 1992, ApJ, 397, 613).

Description: These objects are analogous to the Class II object definition typically applied to lower mass CTTS, but the definition here is much less quantitative. The inner hole may correspond to the dust destruction radius.
Group II (LH)

1. Observational definition, albeit interpreted via theoretical models, pertaining to Herbig Ae/Be stars with SEDs that exhibit mid-infrared emission above that explainable with a geometrically flat optically thick accretion disk (Hillenbrand et al. 1992).

Description: The excess emission was attributed to an envelope. These objects are only vaguely similar to the Class I category as applied to lower mass CTTS. While Group I Herbig Ae/Be stars and Class II CTTS are similar in their physical interpretation, Group II Herbig Ae/Be stars are not necessarily analogous to Class I CTTS in a quantitative sense.
Group III (LH)

1. Observational definition, pertaining to Herbig Ae/Be stars with small near-infrared to mid-infrared excesses that are far weaker than those associated with geometrically flat, optically thick accretion disks and roughly consistent with those associated with Classical Be stars (Hillenbrand et al. 1992).

group I (LH)

1. Observational, strong and almost flat or double-peaked 2-100 μm SEDs in ISO spectrophotometry of Herbig Ae/Be stars (Meeus et al. 2001, Astr. Ap., 365, 476). Sub-categories Ia and Ib are defined by structure in the 10 μm silicate feature with Ib having essentially no broad 10 μm emission bump. Both Ia and Ib can exhibit narrow PAH emission, however.

Description: These objects are roughly consistent with flared disk models (Dullemond).
group II (LH)

1. Observational, weak and declining 2-100 μm SEDs in ISO spectrophotometry of Herbig Ae/Be stars (Meeus et al. 2001). Often have 10 μm silicate emission. Also can exhibit PAH emission, but not as strongly as in the group I objects.

Description: These objects are roughly consistent with self-shadowed disk models (Dullemond).
Classical T Tauri Star (CTTS) (SES)

1. (Original) Observational, a solar-type PMS star that exhibits at least one of the following: (a) broad, strong $H\alpha$ emission (Joy, 1945, ApJ 102, 168); (b) ultraviolet excess emission (above photospheric levels); (c) forbidden and in some cases permitted line emission; and (d) irregular optical variability.

   Description: Such stars can exhibit IR SEDs that span Class I-II, and in some cases, Transition Disk SEDs (see below). Typical examples are AA Tau; BP Tau (Class II); and HL Tau, DG Tau.

2. Physical, A solar-type PMS star surrounded by an accretion disk, and in some cases, an accretion disk and a 'remnant' envelope. An accretion-driven wind, manifest in emission line spectra, is also present.

Description: The key distinguishing characteristics are the presence of an accretion disk and an accretion-driven wind. However, CTTS cover a 'broad' range of evolutionary stages.
Herbig Ae/Be Stars (NC)

1. Observational, a category of spectral type A and B stars that exhibit properties similar to those of CTTS: strong optical emission lines and infrared to millimeter excesses consistent with disk emission.

2. (Orig.) Observational, Herbig (1962) first drew attention to a set of early type objects with emission lines, associated with localized nebulosity and larger scale dark clouds. As is the case for CTTS/WTTS, the original classification implied nothing about the presence of disks, though disks were later recognized as the physical driver for many of the observational characteristics.

Description: These systems are interpreted as pre-main sequence and zero-age main sequence objects, with ages comparable to CTTS and WTTS but larger masses, $2 < M_*/M_\odot < 10$. They are often referred to as just "Herbig Stars".
Weak-line T Tauri Star (WTTS) (SES)

1. (Original) Observational, a "solar-type" ($M_* \sim 0.5M_\odot$, K7-M0), age $\sim$ 1 Myr, pre-main sequence star (from HRD location) that has $W(H\alpha) < 10$ Å.

   Description: The limit was chosen in order to separate objects which showed the signatures of optically thick accretion disks (based on IRAS + NIR SEDs) from those that appeared to be photospheric.

2. (More modern) Observational, any pre-main sequence star that shows no evidence of accretion based on an age and spectral-type appropriate $W(H\alpha)$.

   Description: Firm inclusion in the class would require additional information from high resolution, high S/N spectra to test for the presence (CTTS) or absence (WTTS) of $H\alpha$ profiles indicative of accretion, or signatures (e.g., forbidden [OI] or [SII]) of winds driven by accretion.

3. Physical, a young star that is no longer surrounded by an accretion disk.

Comments: The definition of WTTS was introduced to link signatures of accretion ($H\alpha$ emission; forbidden line emission) diagnosed from the presence/kinematics of gas, with signatures of optically thick disks provided by IR SEDs. The definition that was applied to the initial Taurus sample is obsolete, in the sense that the $W(H\alpha) = 10$ Å limit is an appropriate (and only approximate) discriminant for Taurus-age stars with masses ~ 0.5 $M_{\odot}$. However, the idea of using both gas and dust diagnostics to assess the physical state of the disk is still enormously valuable. In particular, it is by using both SEDs and gas diagnostics that we can probe the evolutionary state of transition/anemic disks and assess/constrain the likely physical cause for the observed SED signature.

Post-T Tauri star (PTTS) (SES)

1. Observational, a young star that exhibits a photospheric spectrum over a wavelength range from the NIR and longward.

   Description: Among solar-type PMS stars, such objects can be identified from their location in the HRD, from their x-ray properties supplemented by HRD location (confirmed from parallaxes; radial velocities; clear membership in a cluster.....) plus a robust SED. Among higher mass stars, such objects might be called "Post Ae/Be stars" and can be identified via their location in the HRD in a cluster/association plus robust SEDs.

2. Physical, a young star of any mass that no longer is surrounded by a circumstellar accretion disk.

3. Physical, an evolutionary step between T Tauri Stars and ZAMS, generally thought to refer to stars on the radiative track.

   Comments: In these definitions, there is no physical difference between a WTTS and a post-TTS. It's just the choice of observational 'tool' for certifying that such an object is no longer accreting material. There is some sentiment on the committee for specifying that a Post-T Tauri star is older than either a CTTS or a WTTS (e.g., with ages of 5-30 Myr). See also naked T Tauri star.

Naked T Tauri star (NTTS) (supplied by Scott Wolk and Fred Walter)

1. Observational, a low mass pre-main sequence star that exhibits no evidence of an optically thick circumstellar disk or on-going accretion.

   Description: In this picture, a NTTS differs from a post-T Tauri star in being an observational definition while the PTTS is described by definition 3 for post-T Tauri Star.

G-type T Tauri Star (GTTS) (LH)

1. Observational, G and K0 type stars that are similar to T Tauri stars

   Description: Used to distinguish them from lower mass K-M traditional TTS and the higher mass Herbig Ae/Be stars. (Herbst and Shevchenko, 1999, AJ, 118, 1043)

Intermediate-Mass T Tauri Star (IMTTS) (NC)

1. Observational, T Tauri stars, with masses between 1.5 $M_{\odot}$ and 4 $M_{\odot}$

   Description: The predecessors of Herbig Ae/Be stars (Calvet et al. 2004, AJ, 128, 1294)

Young Stellar Object (YSO) (NJE)

1. Physical, an object in any of the Stages defined above. (Strom et al. 1975, ARAA, 13, 187)

2. Observational, an object in any of the Classes but with an infrared excess detectable in Spitzer surveys (a definition used by the c2d team to distinguish YSOs from the larger class of pre-main-sequence objects (PMS).

Pre-Main-Sequence Object (PMS) (NJE)

1. Observational, a star that lies above the main sequence.

Comment: This object may or may not have a detectable infrared excess. It is identified by various indicators of youth. It includes CTTS, WTTS, PTTS, GTTS, and NTTS.

protostar (NJE)

1. Physical, an object that is still accreting mass and that will become or already is a main sequence star.

2. Physical, an object deriving most of its luminosity from accretion and that will become a main sequence star.

3. Physical, the entire structure of central star, disk, and envelope.

   Comments: The first definition allows the inclusion of massive protostars, which can be already burning nuclear fuel but still growing in mass. The second does not allow them above a certain mass where the nuclear-burning luminosity exceeds that from accretion. Both the first two apply to the central object, while the third refers to the entire structure. For the first two definitions, objects in Stages 0, I, or II could **host** protostars; For the third definition, only Stages 0 and I would **be** protostars.

protostellar disk (CL)

1. Physical, a primordial disk during the protostellar phase.

2. Physical, an accretion disk associated with a protostar and through which the protostar (Def. #1 or #2) gains most of its mass.

accretion disk (SES)

1. Observational, signified via at least one of the following: (a) broad $H\alpha$ emission, which at appropriate resolution and S/N exhibits kinematic signatures of accretion (inverse P-Cygni); or (b) ultraviolet excess emission (above photospheric levels), (c) gas in Keplerian rotation around the star; or (d)

large amplitude and irregular photometric variability.

Description: the excess UV is thought to arise from hot spots from accreting matter. It is often combined with emission lines (e.g. CO, [NeII], HCN, ...) that exhibit the characteristic double-horned profiles indicative of gas that could supply the accretion.

2. Physical, a disk – isolated or fed by material infalling from a protostellar envelope – which is transporting material inward toward the stellar surface.

circumstellar disk (LH)

1. Physical, any disk of gas and/or dust surrounding a star.

2. Physical, a disk surrounding only a single star, not a binary.

Comment: Definition #1 includes all of the disks described here. Definition #2 excludes circumbinary disks.

primordial disk (LH)

1. Physical, gas-rich circumstellar disk composed of matter originating in the interstellar medium but processed through the star/disk-forming accretion shock.

2. Physical, dust and gas that are present in a ratio close to 1:100 and relatively unprocessed despite the fact that the material is actively evolving through grain growth, settling, and agglomeration and chemical effects. Dust dynamics are controlled by coupling with the gas.

3. Physical, A young disk, possibly accreting and generally optically thick, that is capable of forming planets now or in the future, i.e. protoplanetary.

4. (Orig.) The chemically unprocessed part of the Kuiper Belt beyond 50 AU.

pre-transitional disk (DW)

1. Observational, a YSO with an infrared excess similar to the median of its home cluster over most of the spectrum, but with a substantial deficit compared to the median over some intermediate range of wavelengths.

   Comments: "home cluster" is bit vague, and what about non-clustered YSOs?

2. Physical, a disk around a T Tauri star with an optically-thin gap separating optically-thick inner and outer disk components that resemble, in their excess flux, gap-less disks.

   Comments: This group of objects exhibit specific SED characteristics that are not covered by other more general terms. However, the panel is uncomfortable with the name, which implies an evolutionary sequence that is not necessarily associated with this observational or physical entity. Under the broad definition of a transitional disk (#3), this is just one form of a transitional disk. An alternative term has been suggested for the physical definition: "a disk with an annular gap".

transitional disk (NC)

1. Observational, a disk with a deficit of flux relative to the median of Taurus in the near-IR and fluxes comparable or higher than the median at mid-IR and longer wavelengths.

   Description: These observational characteristics have been interpreted in terms of an inwardly truncated disks with little small dust left in the hole. The truncation has been attributed to several mechanisms, including photoevaporation and formation of planets. (see K. Strom et al. 1989, AJ, 97, 1451 for first use of this term)

   Comments: Further detailed studies of these disks have shown the following variants: (a) disks with NO measurable dust or gas inside a hole of size $>>$ dust destruction radius; (b) disks with measurable, but optically thin dust within an inner hole and extending inward to the dust destruction radius; (c) disks with measurable gas in Keplerian rotation extending inward from the inner hole; dust to gas ratios $<<$ 100.

2. Observational, a disk with fluxes lower than primordial disks (represented by the median in Taurus) at all wavelengths with an excess.

3. Physical, a disk that satisfies the description of EITHER definition 1 or 2; that is, any disk in transition between primordial and debris disks.

Description: These disks show significant effects arising from (a) evolution of dust to larger sizes (this version might be an anemic disk); (b) the combined effects of accretion and photoevaporation; and (c) the dynamical effects of forming planets on the structure, accretion rate and dust content of the inner disks (b and c could be "cold disks" or transitional disks in the more narrow sense of definition #1)

Comments: This is one of the more confused terms. If definition #3 is used, for transitional disk, it includes pre-transitional disk, transitional disks in the narrow sense of definition #1 (also cold disks), and anemic disks. If you use it, be sure to define it.

annular disk (NJE)

1. Physical, a disk with an inner hole with a much reduced abundance of dust.

   Comments: This is a possible replacement term for definition #1 of transitional disks if the broader definition of transitional disk is used. (If you asked a person on the street to name this shape, they would say "halo", but the cosmologists have already misused that term...)

anemic disk (CL)

1. Observational, a disk whose observed flux at all wavelengths is less than that of an optically thick, spatially flat accretion or primordial (CTTS) disk

2. Physical, a homologously depleted primordial (CTTS) disk

3. Physical, an evolved primordial (CTTS) disk

4. Observational, a disk with an IRAC slope intermediate between that of a primordial CTTS disk and a debris disk. Can exhibit active or passive accretion signatures.

Comments: If definition #3 is used for transitional disk, this is one variant of a transitional disk.

debris disk (LH)

1. Physical, circumstellar disk composed of rock, dust, and ice.

2. Physical, gas-poor circumstellar disk in which the primary physical process is the collisional grinding down of planetesimals into smaller particles, eventually dust which is known as "second generation" dust.

3. Physical, optically thin disk in which material is removed from the system via various drag or blowout scenarios on timescales much less than the age of the star.

Description: Indicator of a planetary system given that large, planetary-mass bodies are required in order to induce and maintain the collisional cascade. In our Solar System, the Asteroid Belt and the Kuiper Belt are well-separated debris belts that would be considered a tenuous debris disk if viewed from afar.

protoplanetary disk (CL)

1. Physical, a primordial disk with the potential to form planets.

circumbinary disk (DW)

1. Physical, a binary system and a disk of extent significantly greater than the separation of the binary components.

2. Observational, an infrared excess in a binary system, for which SED or images indicate an extent greater than the separation of the components of the binary.

   Description: The two components may be various pairwise combinations of stars, brown dwarfs, or planets. Each may have its own circumprimary or circumsecondary disk, also lying within the circumbinary disk. The components may truncate the circumbinary disk from within, in which case the system would appear also as a transitional (Def. #1) or cold disk.

gaseous disk (BM)

1. Physical, a disk with a gas to dust mass ratio close to that in the ISM (100:1), typically associated with primordial T Tauri or Herbig Ae/Be disks.

2. Observational, a disk that shows evidence of gas to dust >> 100 via (a) observation of gas tracers such as CO, [Ne II]; or accretion signatures (broad $H\alpha$; inverse P-Cygni emission profiles; [O I], [S II], [N II], [Fe II] and similar wind signatures); and (b) no evidence of dust emission arising from heated small (0.1 to 10 μm) grains.

3. Observational, an object with small IR excess emission (<< that expected from an optically thick disk), and with SEDs that mimic those observed around classical Be stars (which are thought to be surrounded by gaseous EX-cretion disks).

Description: Hillenbrand et al. (1992, ApJ, 397, 613) dubbed intermediate mass objects falling into this category "Group III" Ae/Be stars.

Comments: Note that these definitions are all quite different from one another. If you use this term, be sure to define it.

optically thick disk (BM)

1. Physical, a disk with an optical depth to its own radiation larger than one at most radii.

   Description: Usually associated with an SED slope close to -1 in νS_ν, or a substantial ratio of disk luminosity to stellar luminosity.

2. Physical, a disk that is optically thick at most radii to the radiation from the star.

   Description: usually associated with an observation of L_{disk}/L_{star} at least 0.1.

Comments: Note that these two definitions are completely different. If you use this term, be sure to define it. Note that definition #1 should specify the wavelengths being discussed or should specify that one is referring to something like the Rosseland mean opacity.

optically thin disk (BM)

1. Physical, a disk with an optical depth to its own radiation much smaller than 1 at most radii. Description: It is usually associated with an SED slope close to -3 in νS_ν, or a low ratio of disk luminosity to stellar luminosity.

2. Physical, a disk optically thin at most radii to the radiation from the star.

   Description: usually associated with an observation of $L_{disk}/L_{star} < 0.01$.

   Comments: Note that these two definitions are completely different. If you use this term, be sure to define it. Note that definition #1 should specify the wavelengths being discussed or should specify that one is referring to something like the Rosseland mean opacity.

cold disk (LC)

1. Observational, based on the mid-IR flux ratio, specifically the flux density ratio between 30 and 13 μm: $S_\nu(30)/S_\nu(13) > 5$ (Brown et al. 2007, ApJL, 664, 107).

   Description: These observational characteristics have been interpreted in terms of disks with inner holes or wide gaps with little dust ($M_{dust} < M_{Moon}$) left in the hole/gap.

2. Observational, a primordial disk with little or no near-IR excess.

3. Observational, a disk whose SED rises steeply at wavelengths longer than expected if the disk extended to the dust sublimation radius.

4. Physical, a truncated disk missing the hot inner disk.

Comments: If the broad definition of transitional disk is used (Def. #3), this is one form of a transitional disk, and the term cold distinguishes it from anemic disks, for example. If definition #1 for transitional disk is used, this is an observational synonym for transitional disk. Some people did not like the name because many of the "cold" disks are accreting and thus have some very hot gas. Others did not like the term because "cold" is a physical term, while a "cold disk" is an observational definition. Here "cold" refers to the SED.

hot/warm disk (LC)

1. Physical, relative term to indicate the region of the disk where the temperature is higher/intermediate.

2. Physical, the innermost part of the disk/the warm surface layer of a flared disk.

3. Observational, a disk whose SED shows near-IR excess.

   Comments: The terms are very vague and not commonly used.

flat disk (NC)

1. Physical, disk height is constant with radius

Description: their spectral energy distribution is $\lambda F_\lambda \propto \lambda^{-4/3}$

flared disk (NC)

1. Physical, the ratio of disk height to radius increases with radius

Description: their spectral energy distribution λF_λ is flatter (less steep) than $\lambda^{-4/3}$ Often the dependence is more like λ^b with b between 0 and 1, but there are likely intermediate cases.

Parts of Disks:

inner disk (DW)

1. Physical, the portion of a YSO disk lying closer to the central star than the outer disk.

   Comments: This is a relative term, and the disk domain to which it refers needs to be defined and limited to its context.

outer disk (DW)

1. Physical, the portion of a YSO disk lying further from the central star than the inner disk.

   Comments: This is a relative term, and the disk domain to which it refers needs to be be defined and limited to its context.

We thank the audience at the panel discussion for lively comments and corrections. In particular, we thank L. Allen for finding some errors and S. Wolk and F. Walter for supplying an additional definition.