T04

# 低金属量下における原始惑星系円盤の寿命

## *The Lifetime of Protoplanetary Disks in Low-metallicity Environments*

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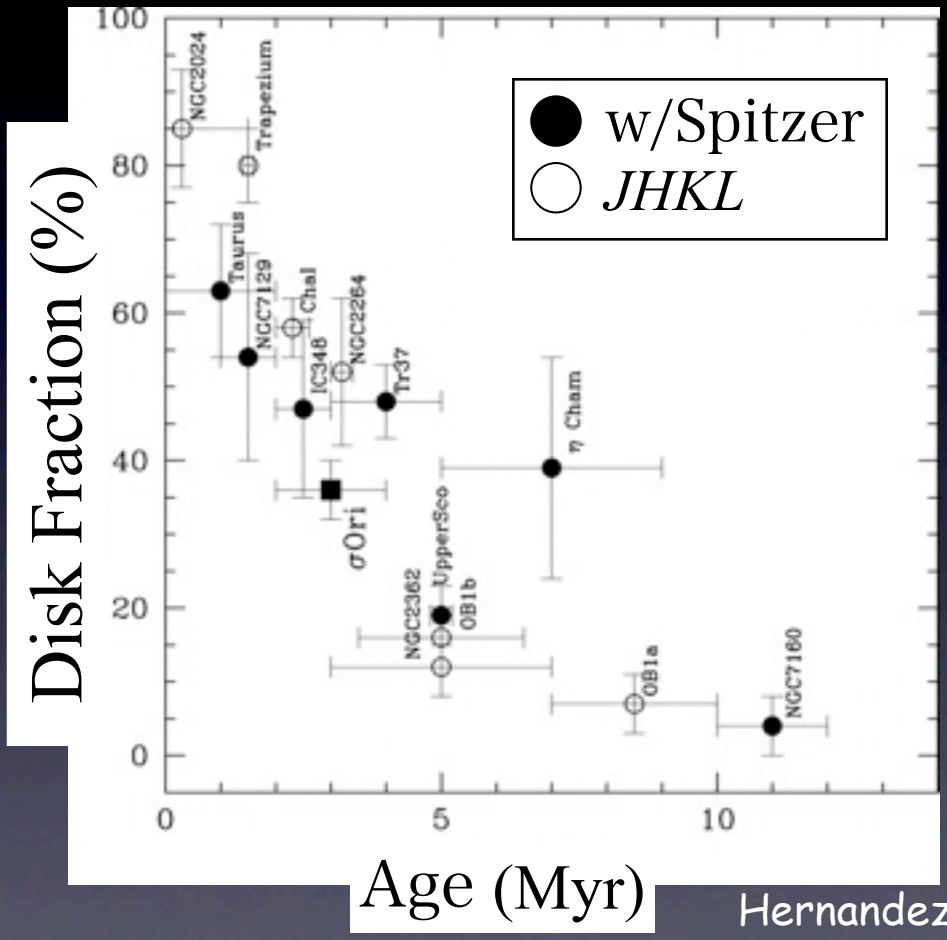
# Lifetime of Protoplanetary Disk

## ◆Disk fraction of Young Clusters (NIR&MIR)




Hernandez+ (2007)

✓Disk lifetime: **5-10 Myr**
**in the solar neighborhood**

(e.g., Lada 1999, Haisch+ 2001, ApJ, **553**, 153, Hernández+ 2007, ApJ, **662**, 1067)

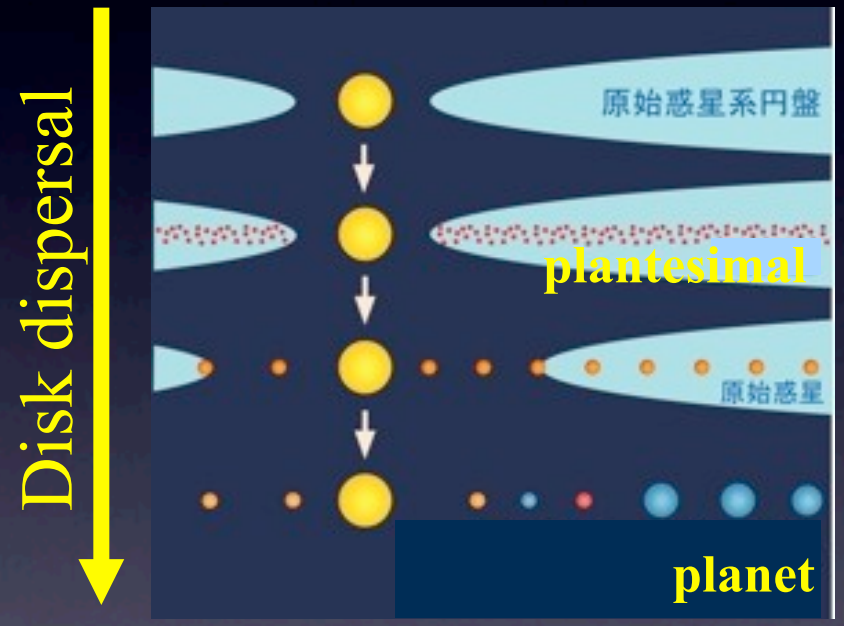
*Is the lifetime same even in different environments?*

# 1 . INTRODUCTION

# Disk Dispersal & Planet Formation

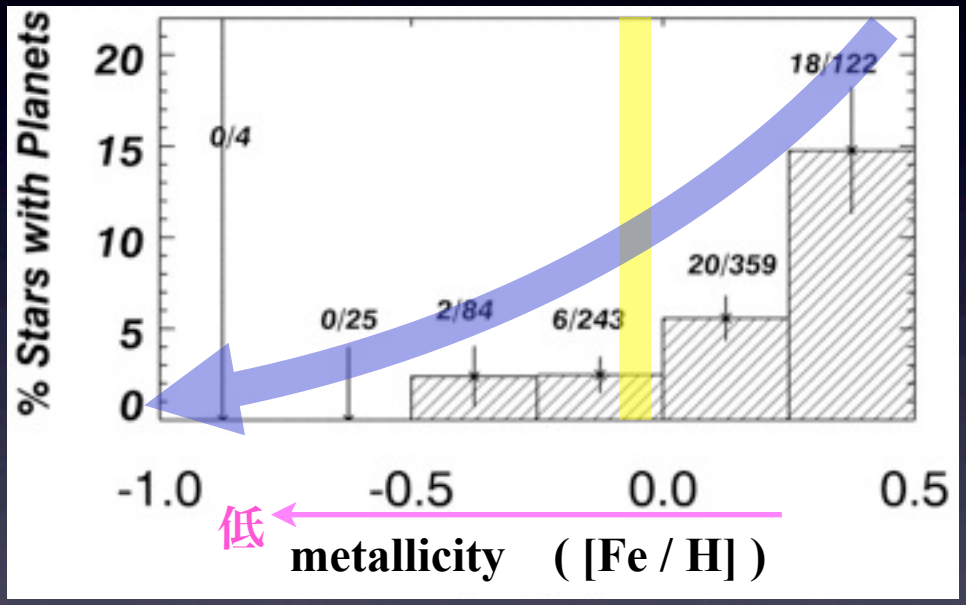
## ◆Planet formation process ~core accretion model~

(Safronov 1969, Hayashi et al. 1985)




(http://risu.lowtem.hokudai.ac.jp/~hide/naiyou.html)

## ◆Planet-metallciity correlation



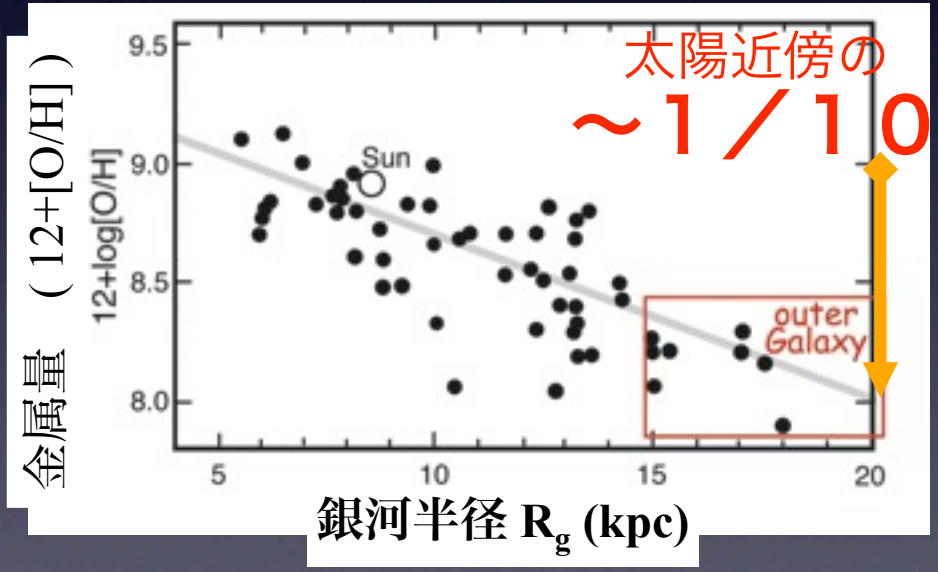

for FGK-type stars Fischer et al. (2005)

*Disk lifetime in other metallicity environments is of great interest*

## 2. OBSERVATION

Photo: Todd Boroson/NOAO/AURA/NSF

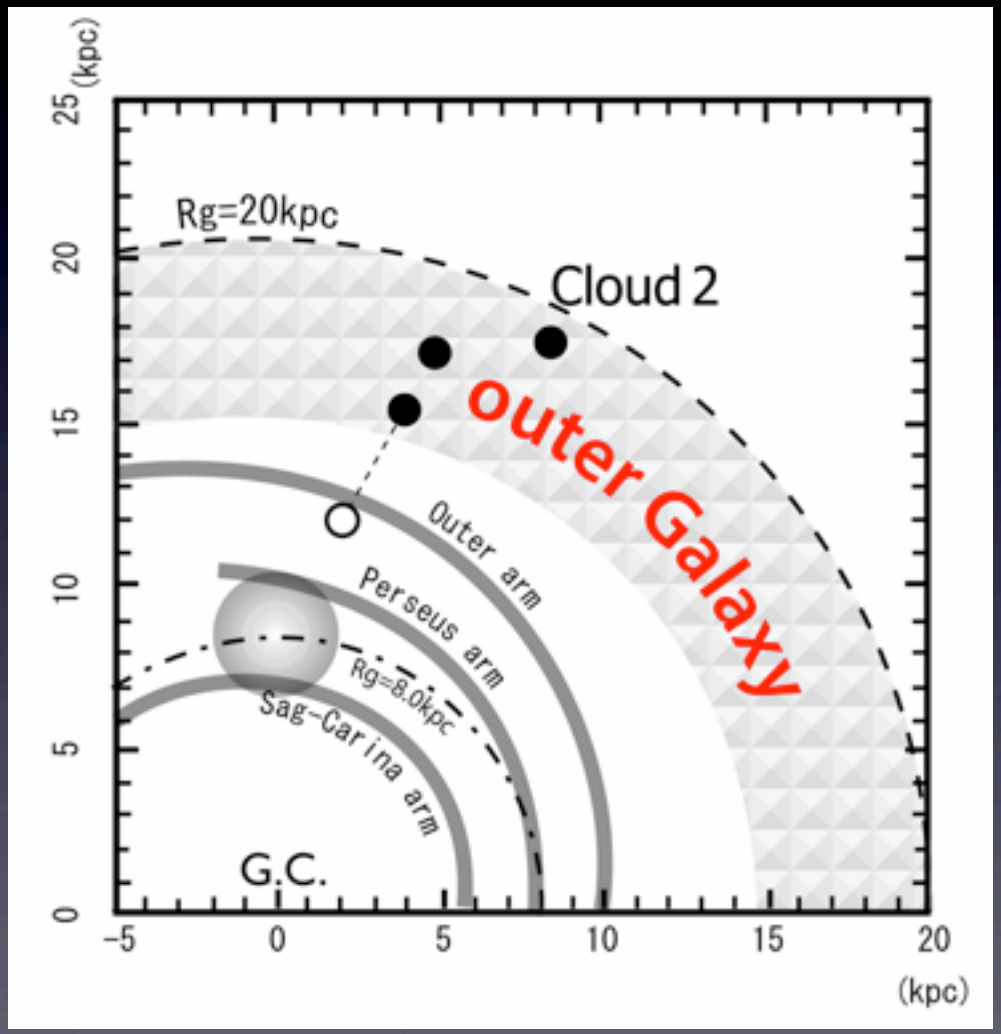
- ◆ The outer Galaxy
  - ✓ $R_g \gtrsim 15$ kpc
  - ✓ very low metallicity
    [O/H]~−1 dex
- ➢ Our targets: 6 clusters
  - ✓ average metallicity
    [O/H]=−0.7 dex




- ◆ $JHK_S$ deep imaging w/Subaru MOIRCS
  - →mass detection limit ～0.3 $M_\odot$
    (similar to nearby clusters)

# Cloud 2 clusters @ Rg=19 kpc

(Kobayashi & Tokunaga 2000, Yasui et al. 2006, 2008, Kobayashi et al. 2008)

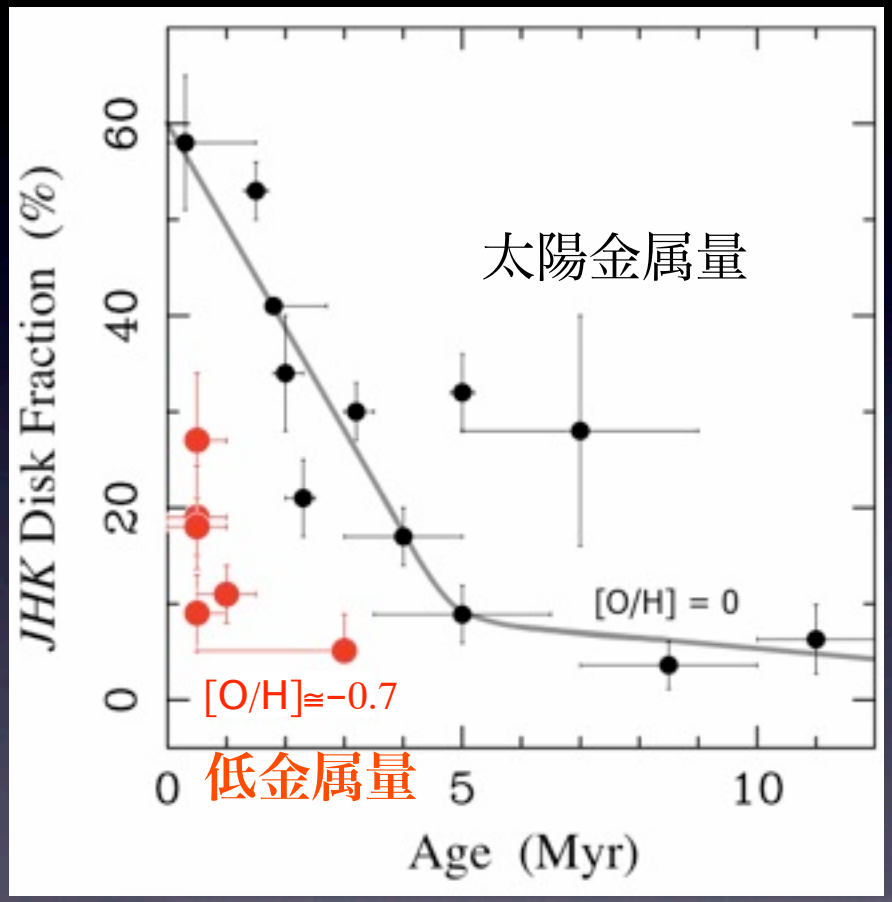



Cloud2-N

Cloud2-S

3 . RESULTS

# *JHK* Disk Fraction in Low-metallicity Environments



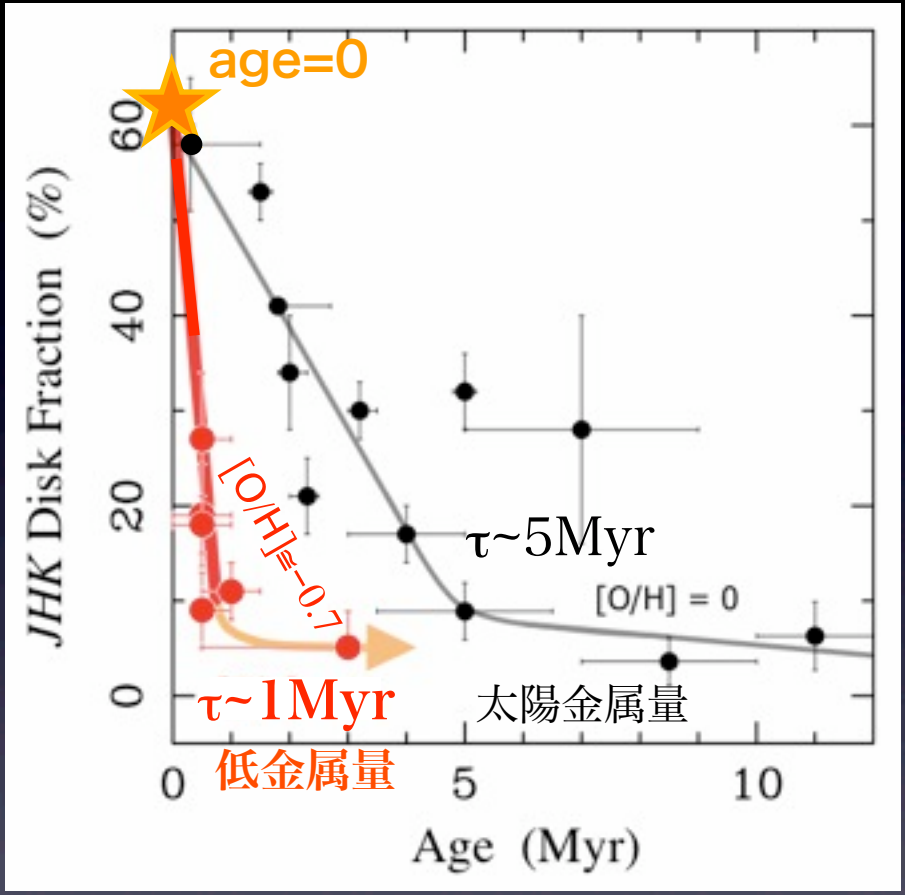

Systematically lower than nearby embedded clusters of similar age

⬇

Disk fraction depends on metallicity

Preliminary results (with Cloud 2) are published in
Yasui et al. (2009) *ApJ*, 705, 54

# 4. DISCUSSION
# Disk Lifetime




## In Low-metallicity Environments…

- ✓ initially optically thick even in low-metallicity
- ✓ inner region is not expected to be cleared out

- **"entire" disk dispersal (τ~1Myr)**
- ***initially* (age=0)** expected to be high disk fraction

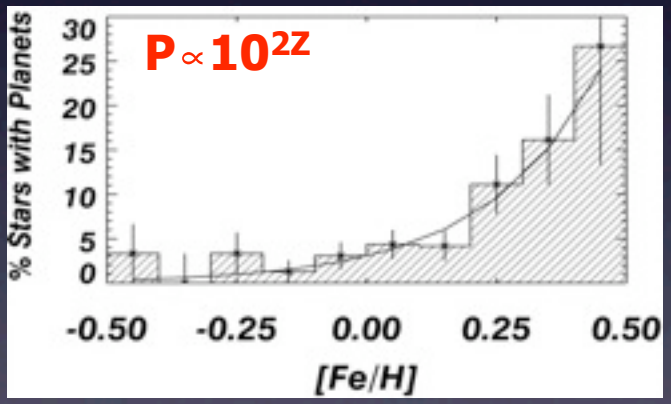
$\tau \propto 10^{Z}$

**Disk lifetime is shorter in low-metallicity environments**

# 4. DISCUSSION

◆Possible mechanism of short disk lifetime?

◆Insight into the steep ($P \propto 10^{2Z}$) "planet-metallicity correlation"




Please come to see our poster paper for more detail (T04)