N AND H IN THE SOLAR SYSTEM:
THE ORIGIN AND DISTRIBUTION OF WATER

For both H and N, The Solar System has only Three Types of Abundant Molecules.

1. NITROGEN

1
PROTOSOLAR NITROGEN

$^{15}\text{N} / ^{14}\text{N}$

10$^{-3}$

10$^{-2}$

9

8

7

6

5

4

3

2

1

0

HCN COMETS

NH$_3$ COMETS (?)

EARTH, METEORITES

N$_2$ JUPITER = SUN
Bulk N contents and N-isotopic compositions of meteorites.

Krot et al. (2003), Ivanova et al. (2006)
Wild2 carbon and nitrogen isotopes

- Literature data for IDPs
- Microtome particles
- Aluminum crater residue
- Fragments in Au foil
- "Hotspots"

\[ \delta^{15}N \] vs. \[ \delta^{13}C \]
HYDROGEN
Figure 2. Histograms of distributions of the water D/H ratio in Carbonaceous Chondrites, in LL3 chondrules and clays, in Hot Cores and in interstellar ice (personal compilation of published data). According to this diagram, LL3 chondrites exhibit the best preserved record of the primordial isotopic heterogeneity of the solar system water. Note the similarity between the high D/H values in LL3 chondrites and in interstellar ices.
HYPOTHESIS
(PRELIMINARY)
H2O ICE SUBLIMES ON PASSAGE THROUGH SNOWLINE

VAPOR ALLOWS ISOTOPIC EXCHANGE WITH H2

CONDENSATION “FREEZES” NEW ISOTOPE RATIOS
HYPOTHESIS NITROGEN

NH3 ICE PASSES THROUGH SNOWLINE IN H2O ICE (NO N2 IN THIS ICE)

SUBLIMES

NO ISOTOPE EXCHANGE OF VAPOR WITH NEBULA N2

BIG UNKNOWN:
SNOWLINE
SUPPORT

URANUS AND NEPTUNE: INTERMEDIATE D/H

2. NH$_3$

$^{15}$N/$^{14}$N CONSTANT IN INNER SOLAR SYSTEM (N2≠>NH3

_________DISSENT

{CENSORED BY DICK

CHENEY}

TEST:

NH3 IN COMET ICE---
EARLY HYPOTHESIS:

WATER
THROUGHOUT INNER SOLAR
SYSTEM (=INSIDE SNOW LINE)
REPRESENTS
DEUTERIUM EXCHANGE
BETWEEN
\textit{H}_2 \textit{GAS} AND \textit{H}_2\textit{O VAPOR}.
THE VAPOR COMES FROM
PROTOSOLAR ICE IN ALL
TYPES AND SIZES OF
ICY PLANETESIMALS
AS THEY CROSS THE SNOW LINE