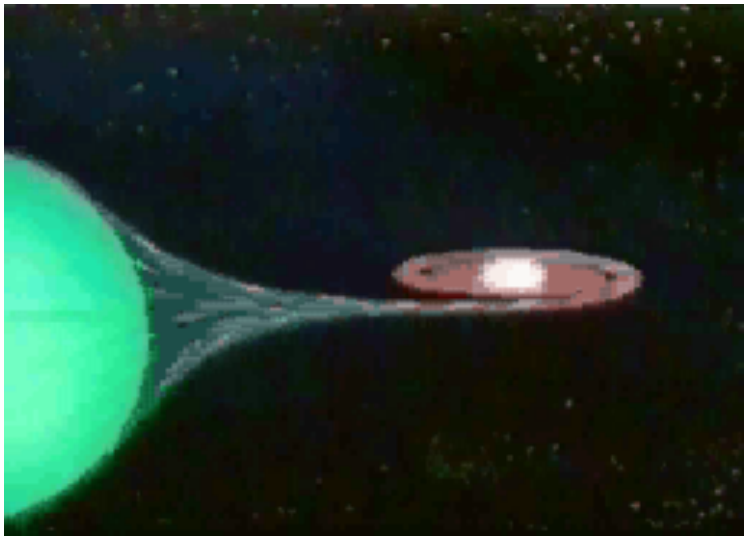
Type Ia supernovae

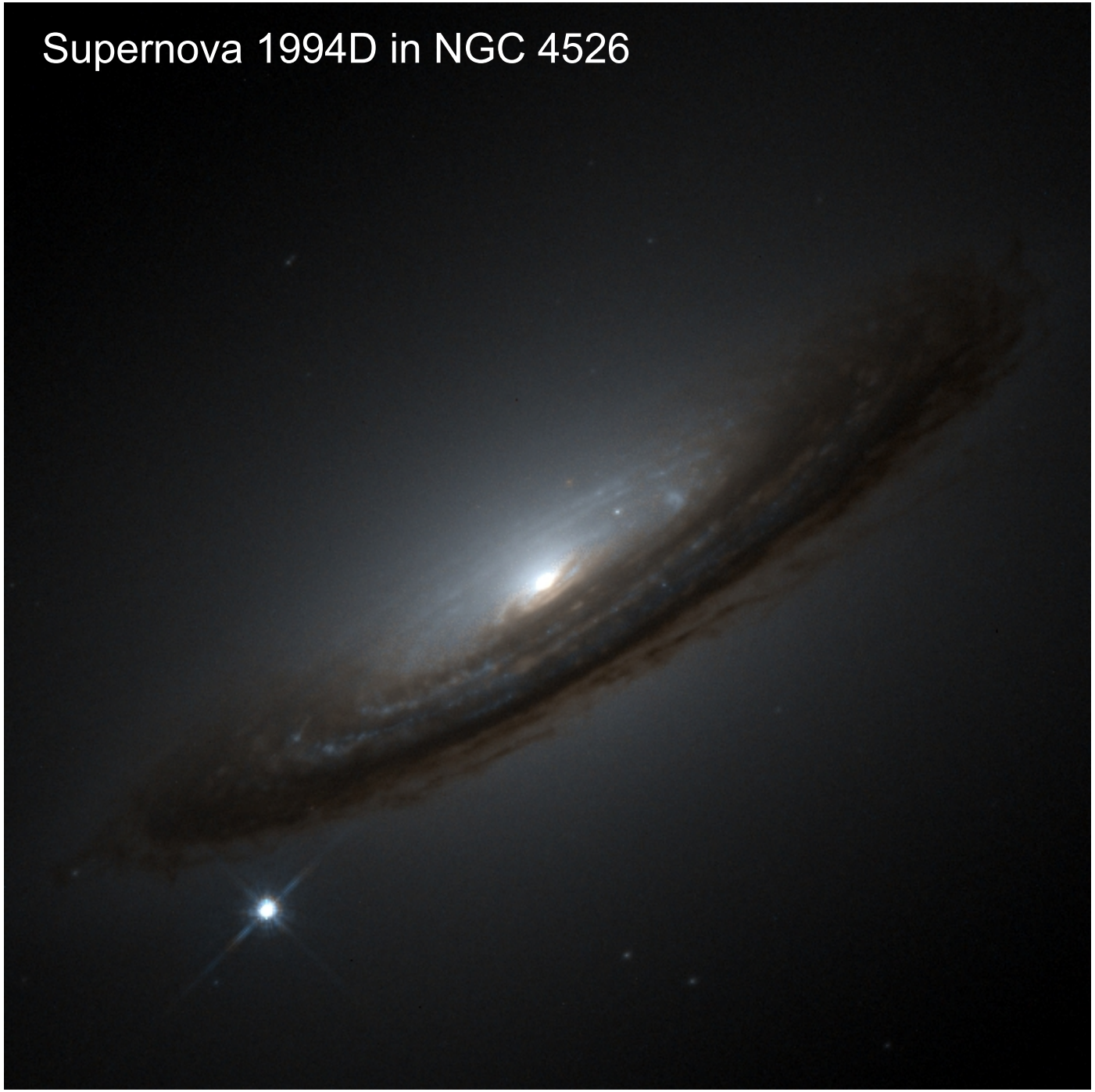


white dwarf accreted matter and grows beyond the Chandrasekhar limit

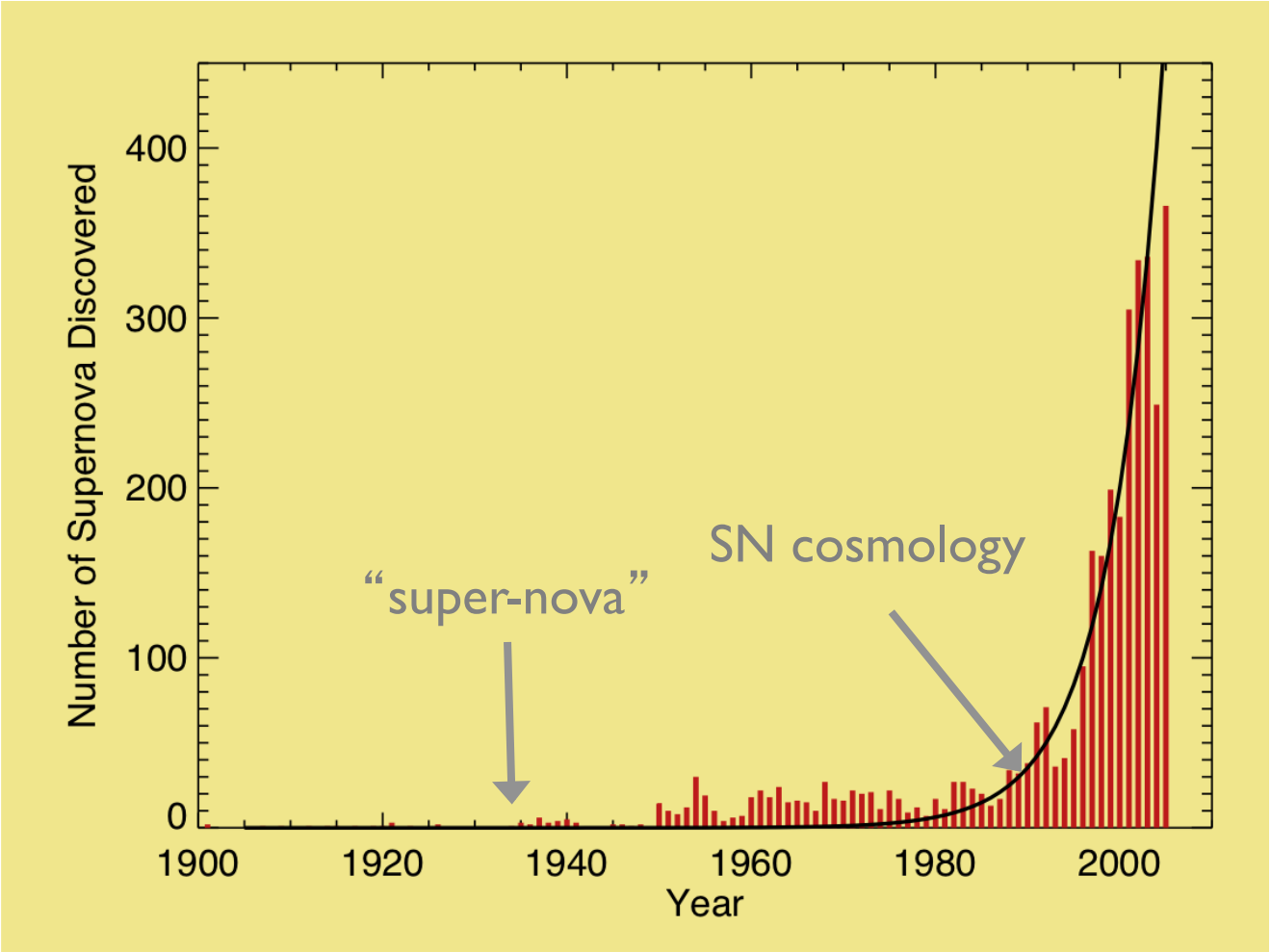
→ star explodes – no remnant

Other possibilities:

- WD-WD merger (total mass can be above Chandrasekhar mass)
- He layer on surface explodes and triggers WD explosion (sub-Chandrasekhar mass)

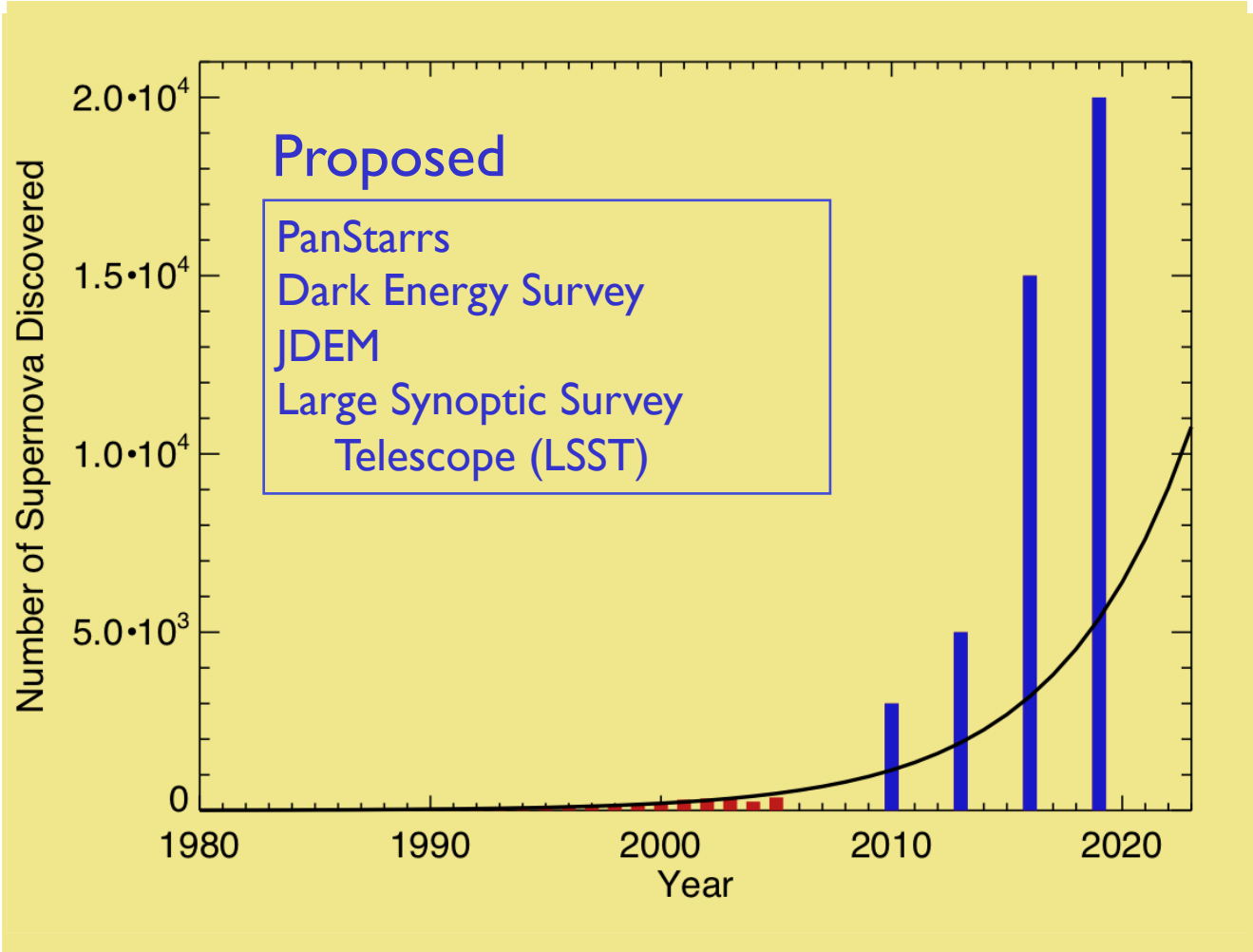

Supernova 1994D in NGC 4526

Discovery rate of type Ia supernovae



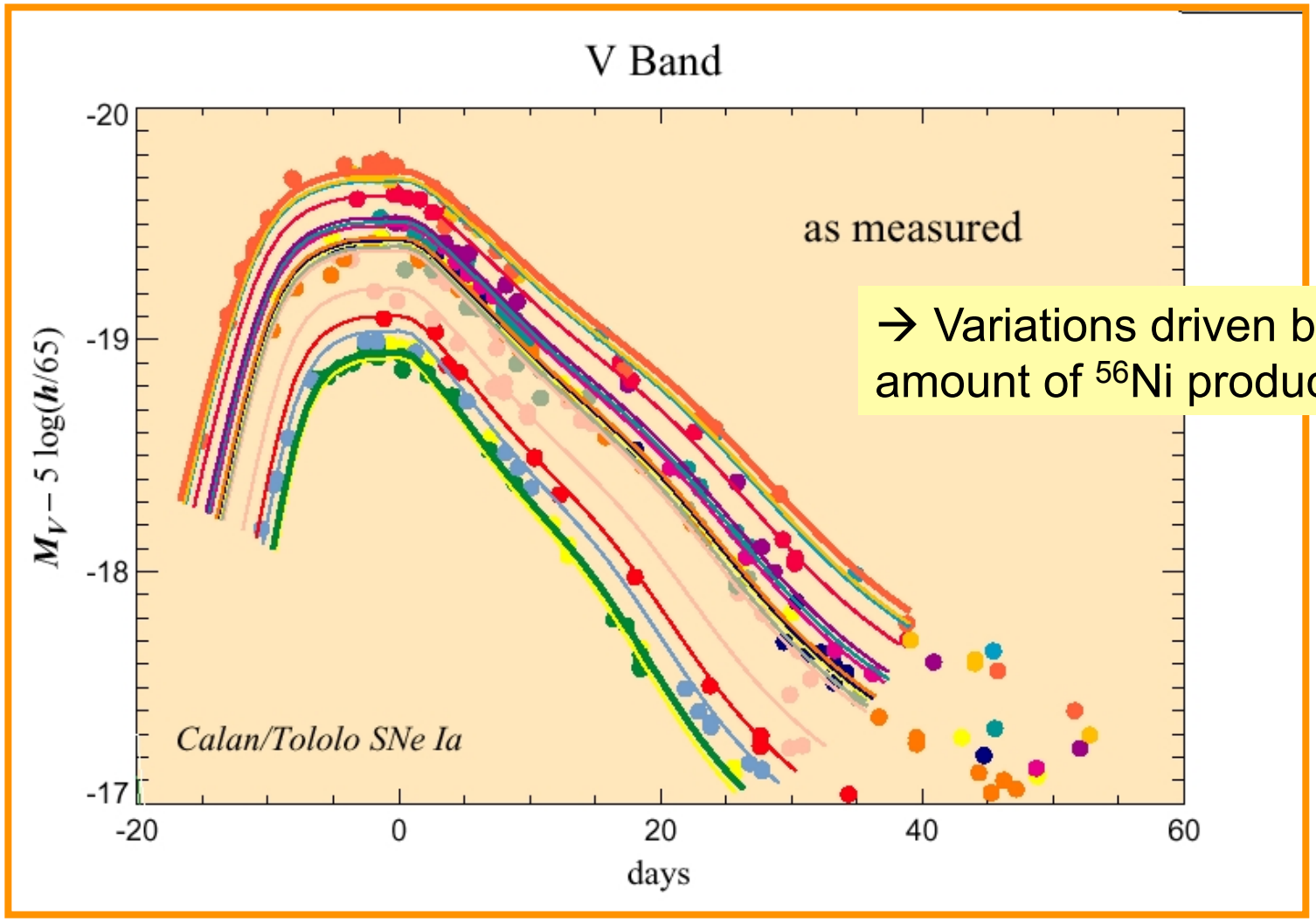
D. Kasen, presentation

Discovery rate of type Ia supernovae



D. Kasen, presentation

Absolute brightness variations of type Ia supernovae



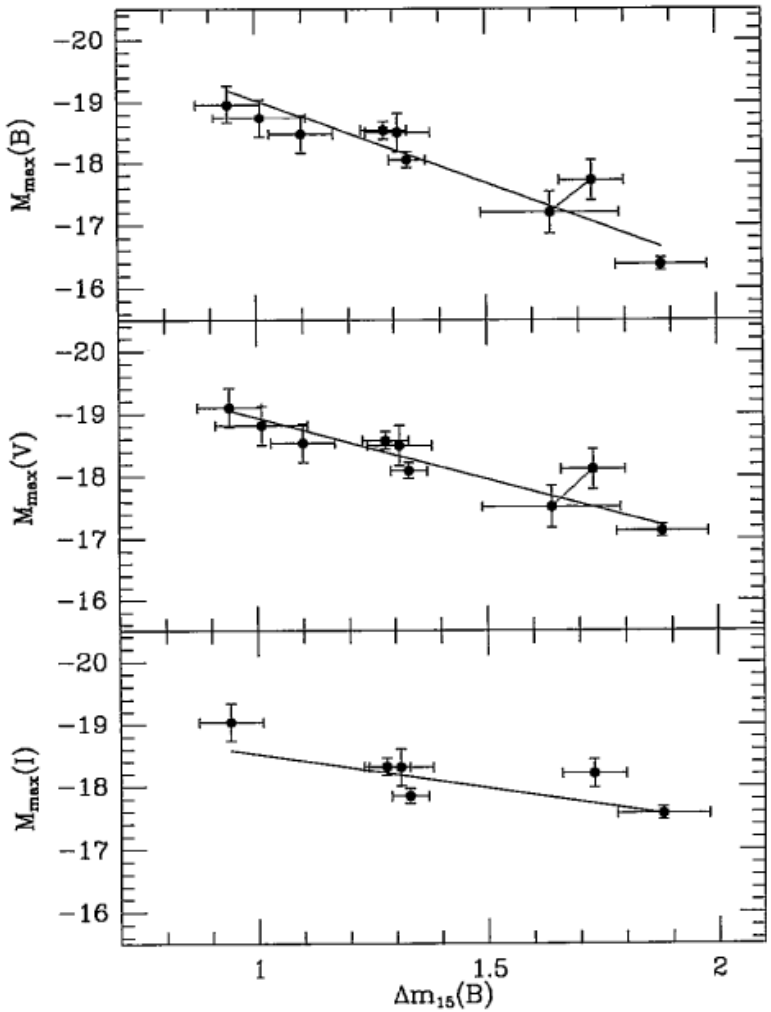
→ Variations driven by amount of ^{56}Ni produced

Origin of variations?

Timmes, Brown, Truran 2003: ^{22}Ne ~ Z (why?) (^{22}Ne has 10 protons and 12 neutrons !)
→ presence of ^{22}Ne reduces Ye below 0.5 and therefore the amount of ^{56}Ni produced

Phillips relation:

Decline rate $\Delta m_{15}(B)$: magnitude decline during first 15 days in B-band is related to ABSOLUTE peak brightness M_{max}:

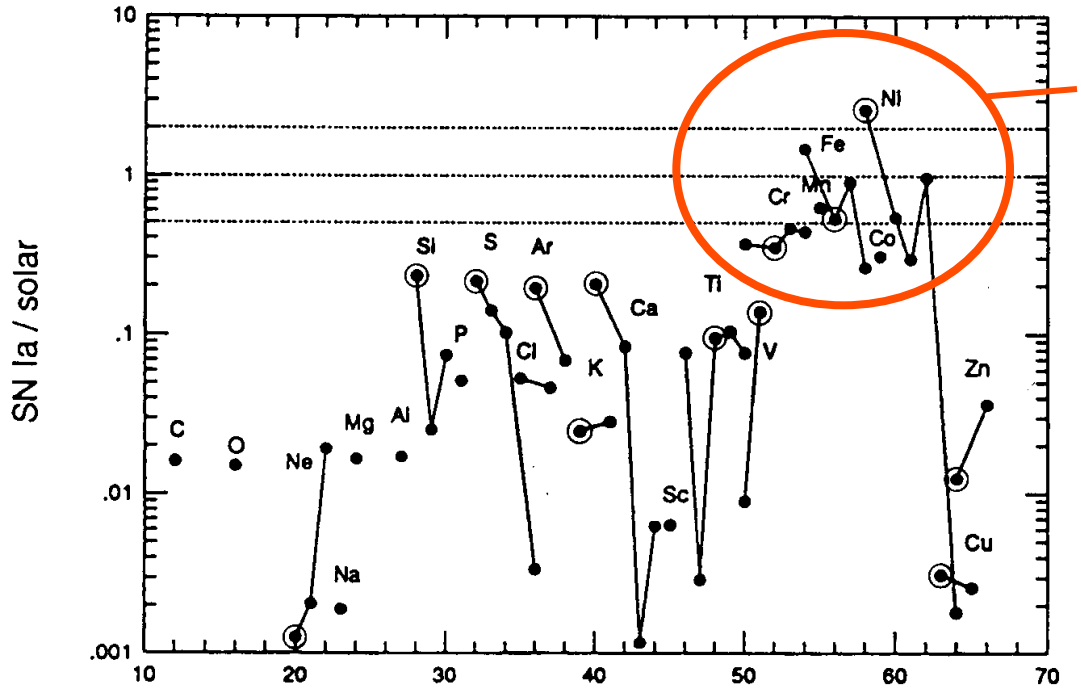


Phillips, ApJ413(1993)105

→ Can use type Ia's as standard candles !

Nucleosynthesis contribution from type Ia supernovae

CO or ONeMg core ignites and burns to a large extent into NSE

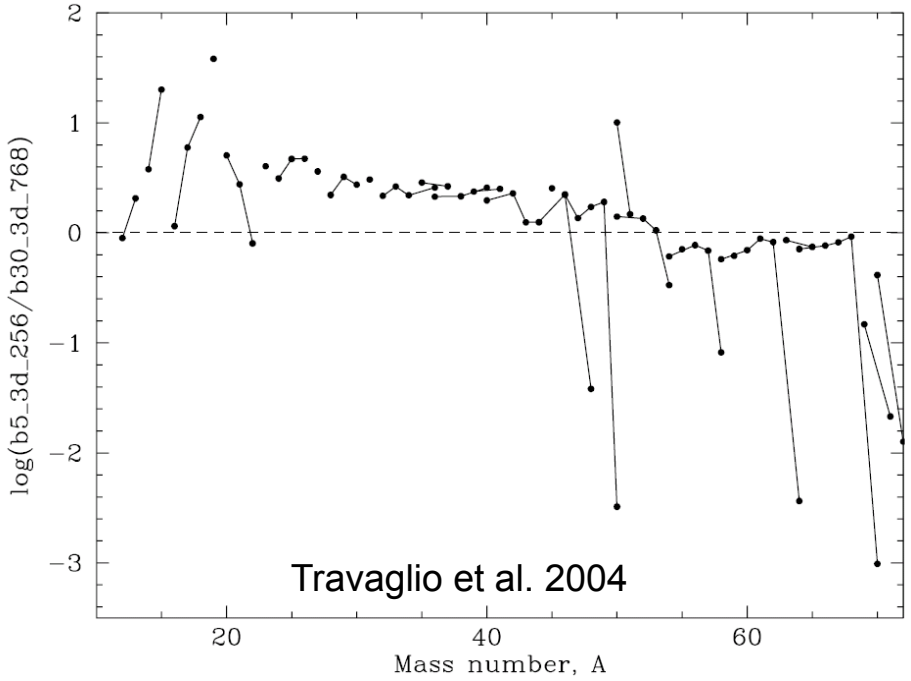


(Pagel 5.27)

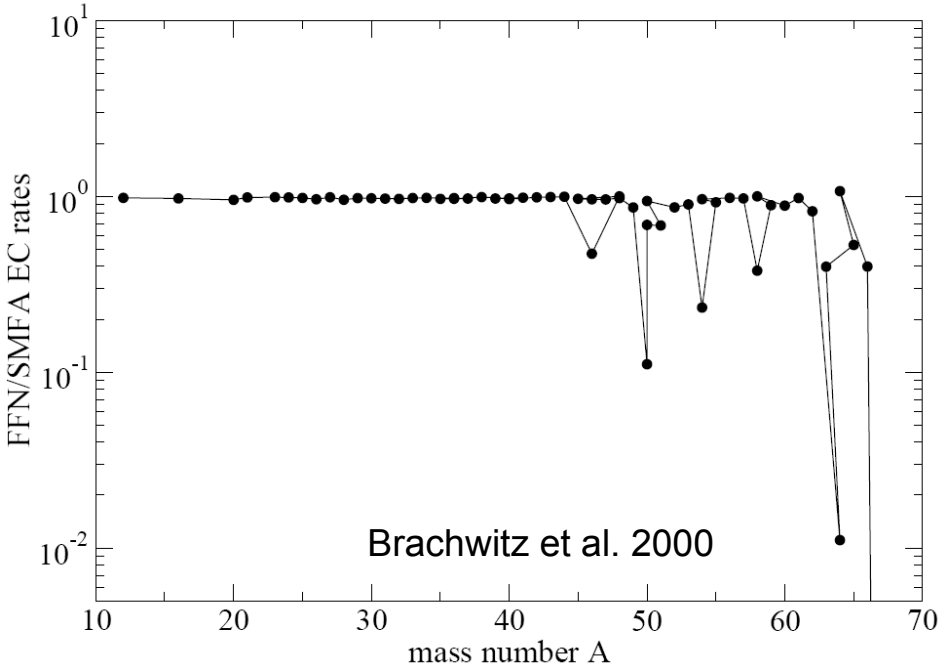
→ Has to be consistent with solar abundances
→ Nucleosynthesis is a prime constraint for models

Sensitivity of type Ia supernova nucleosynthesis

Different models: 5 bubbles/30 bubbles



Different nuclear models for EC rates



Nucleosynthesis is one important diagnostic tool for SN type Ia models

→ Need experimental EC rates to use it
→ EC rates might also matter directly in explosion (currently explored)
→ EC rates are also an ingredient for core collapse SN models