Steps Towards Reheating in D̅D̅ Inflation

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D. Chialva, G. Shiu, B.U., hep-th/0508229
Great Lakes Strings Conference, 2006
Inflation
Attraction between D3-\D3 branes

• **Toroidal Compactification**: D-branes located at antipodal point on torus, branes at angles
  
  Shandera, Shlaer, Stoica, Tye, hep-th/0311207

• **KKLMMT**: Background fluxes on CY conifold, creates warped throats.
  
  KKLMMT, hep-th/0308055

• **DBI Inflation**: Motion of D-brane in warped throat speed limited
  
  Silverstein, Tong, hep-th/0310221
Annihilation

• D-D pair annihilate into massive closed strings ("tachyon matter")
Lambert, Liu, Maldacena, hep-th/0303139

$$N_{\text{max}} \sim \frac{1}{g_s^2}$$

How does energy from closed strings partition into low energy degrees of freedom?
Decay of Massive Closed Strings

- KK modes suppressed by phase space
  - Graviton overproduction? $\Omega_{GW}<10^{-6}$
  - Enhanced Coupling of KK at tip of throat
- Timescale is Short: $\Delta t \sim h_i^{-2} m_s^{-1}$

$$\Gamma_g \sim g_s^2 \Omega \left( \frac{N_0}{2\sqrt{N}} \right)^3 e^{-2a(\sqrt{N}-\sqrt{N-N_0})}$$

$$\Gamma_{KK} \sim g_s^2 \Omega h_i^{-2} \left( \frac{N_0}{2\sqrt{N}} \right)^2 e^{-2a(\sqrt{N}-\sqrt{N-N_0})} \sum_{n=1}^{\infty} \sqrt{\frac{N_0^2}{4N} - m_{kk}^2}$$
Transfer of Energy to SM

- Multithroat models: turn on closed string fluxes on conifold cycles.

- KK wavefunction enhanced at tip of AdS throat.

Barnaby, Burgess, Cline, hep-th/0412040
Kofman, Yi, hep-th/0507257
Dimopoulos, Kachru, Kaloper, Lawrence, Silverstein, hep-th/0106128

KK modes must tunnel through potential barrier

Reheat Temperature:

\[ \Gamma_{tunn} \sim (\text{Prob})(\text{flux}) \sim h^5_ik \]

\[ 10^{13} \text{ GeV} \leq T_{RH} \leq 10^{14} \text{ GeV} \]
Outlook

• Simple picture modified: Reheating Possible
  – KS throat Firouzjahi, Tye, hep-th/0512076
  – Tunneling Details Langfelder, hep-th/0602296

• Dynamical Throats: Stringy Reheating?
  – Frey, Mazumdar, Myers, hep-th/0508139

• Single Throat: DDDB System?

• Relativistic Reheating in DBI scenario