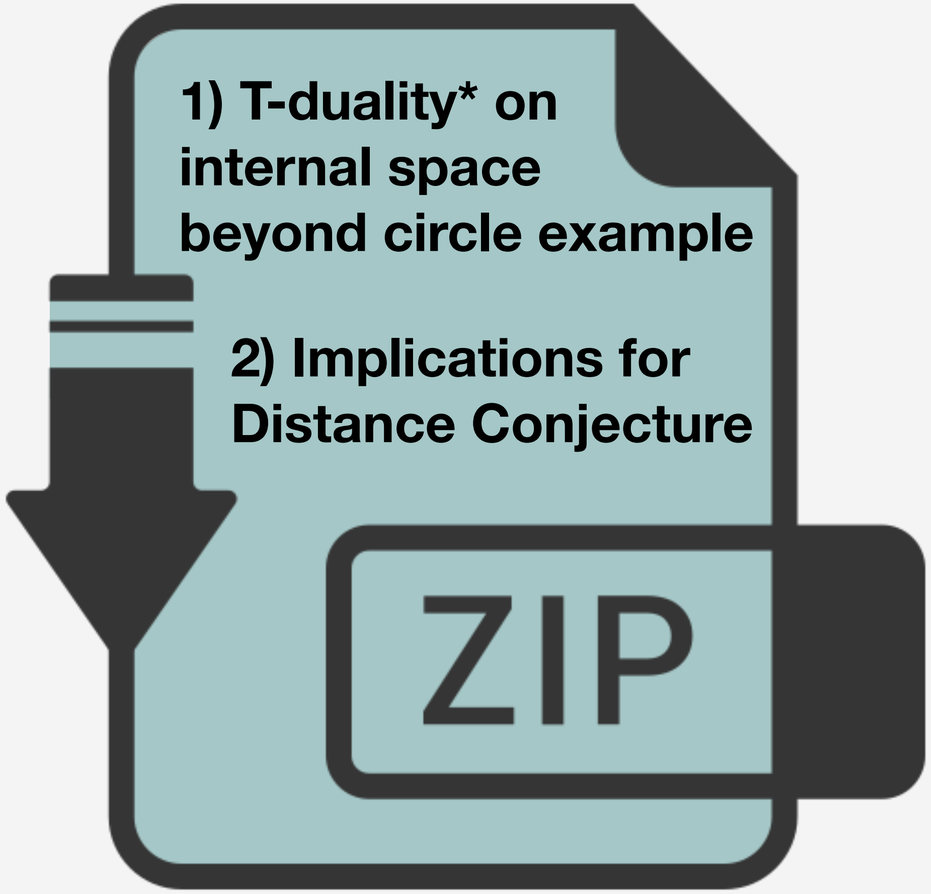
MAX PLANCK INSTITUTE
FOR PHYSICS

Topology change and non-geometry at infinite distance

[Saskia Demulder, Dieter Lüst, **TR**; **2312.07674**]

Geometry, Strings and the Swampland Program
Ringberg, 19.03.2024

Thomas Raml



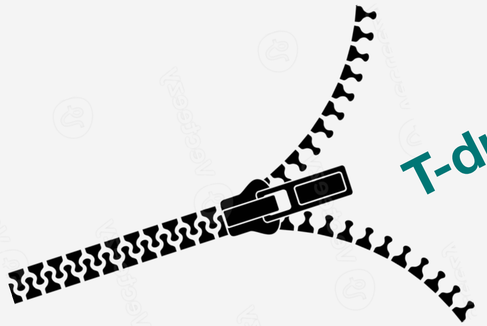
*generalized

1) T-duality* on internal space beyond circle example

2) Implications for Distance Conjecture

ZIP

*generalized



T-duality

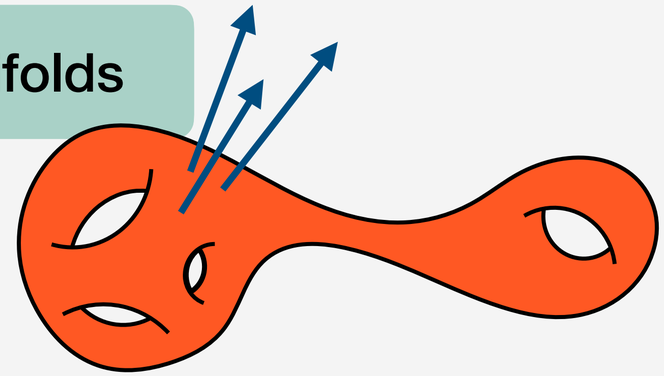
Non-trivial fibrations

$S^1 \hookrightarrow E$

Curved manifolds

Fluxes

$H = dB, F = dC$



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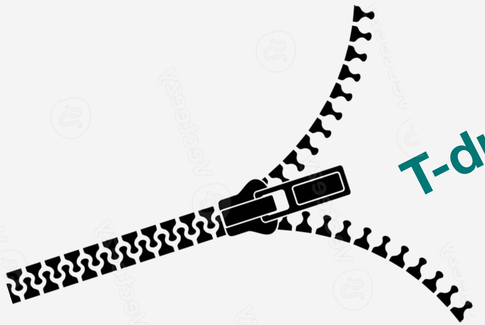

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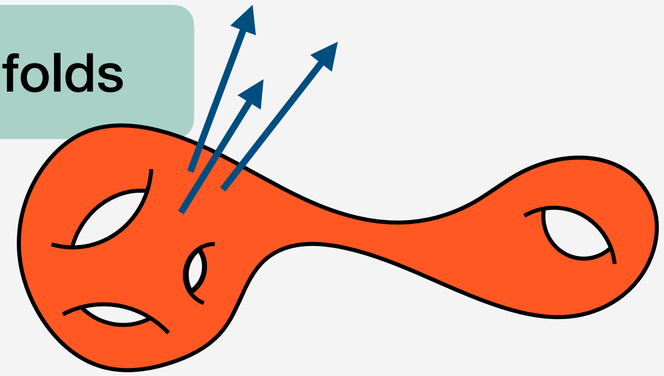
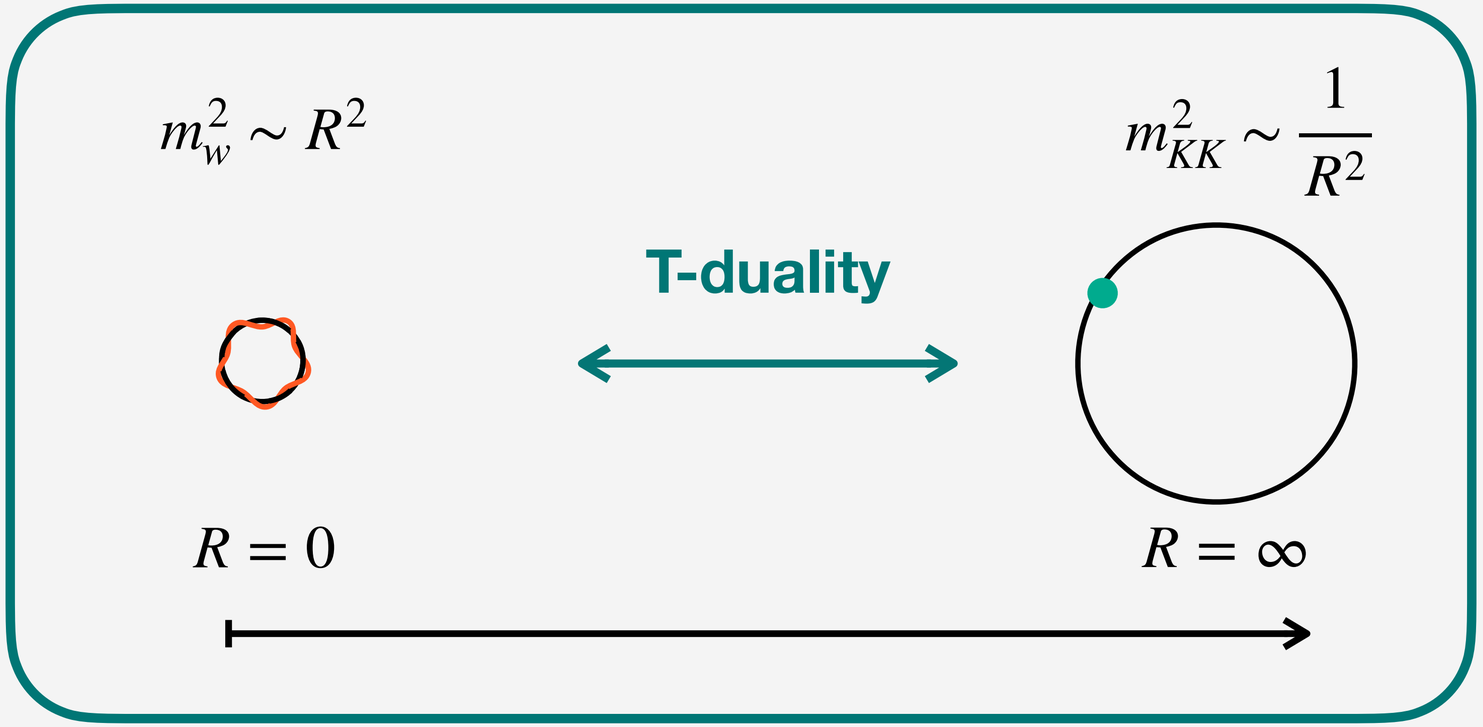


- Non-trivial momentum-winding exchange
- Moduli spaces with (NSNS) flux contributions
- Scalar potential on moduli space
- Non-geometric backgrounds

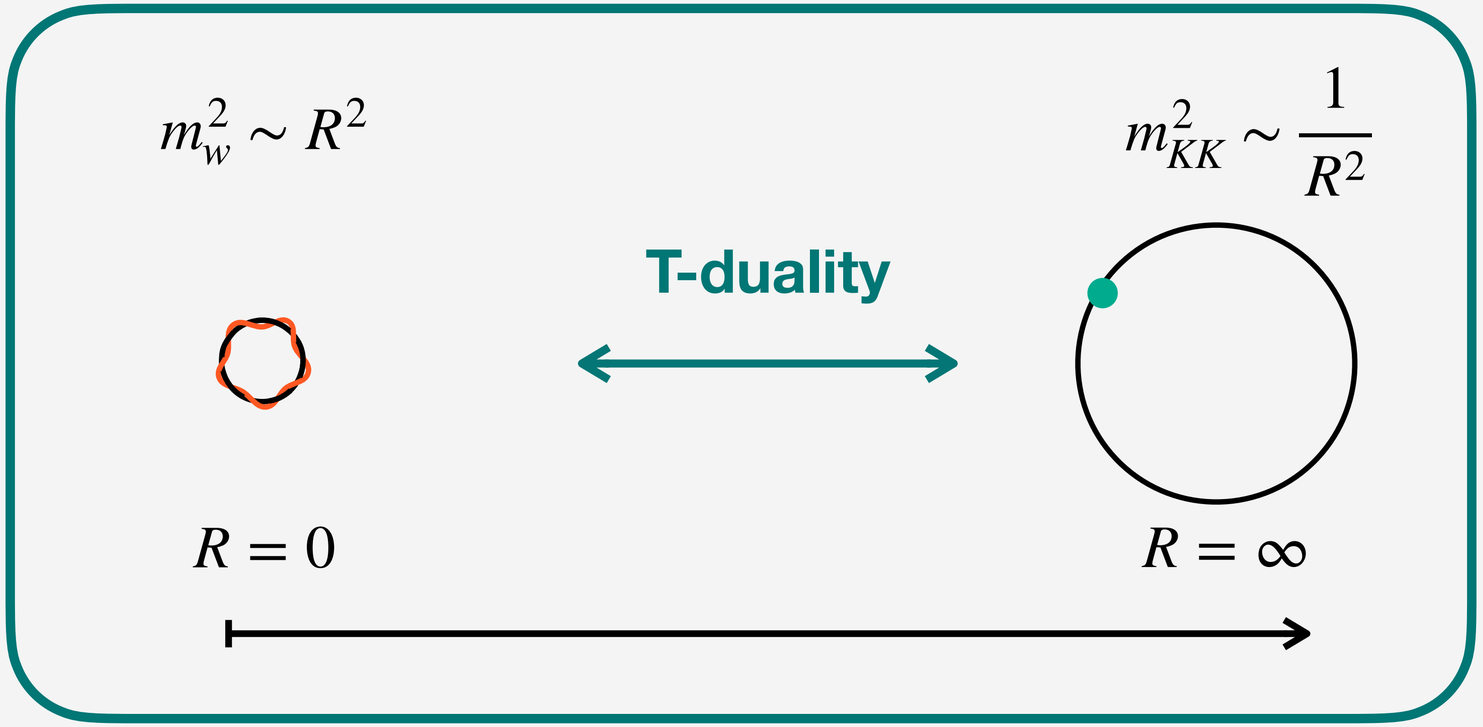
Recap: Reduction on trivially fibred S^1

$$S_{\text{EH}} \sim \int \mathrm{d}^{D-1}x \sqrt{-g} \left(\mathscr{R}(g) - \frac{c}{R^2}(\partial R)^2 \right)$$



Recap: Reduction on trivially fibred S^1

$$S_{\text{EH}} \sim \int \mathrm{d}^{D-1}x \sqrt{-g} \left(\mathscr{R}(g) - \frac{c}{R^2}(\partial R)^2 - V(R) \right)$$



Reduction on trivially fibred internal space $S^1 \hookrightarrow M_n$:

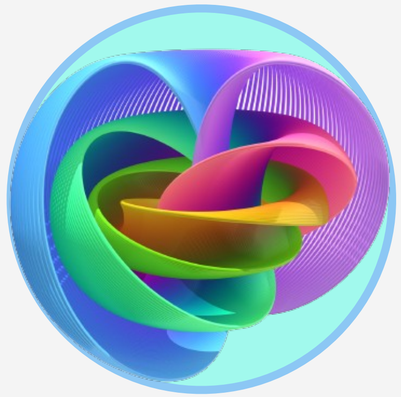
non-

and/or in presence of fluxes

$$S_{\text{EH}} \sim \int \mathrm{d}^{D-n}x \sqrt{-g}\left(\mathscr{R}(g) - \gamma_{ij}\partial_\mu \phi^i \partial^\mu \phi^j - V(\phi^i)\right)$$

metric on moduli space

~~winding~~



$S^3_R,\ H = 0$

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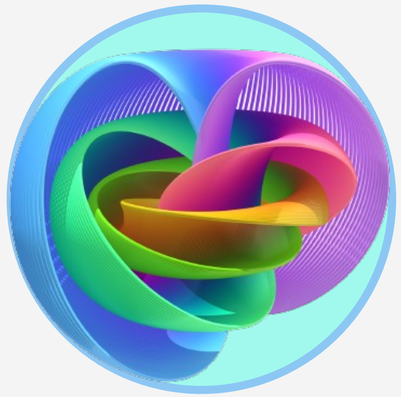

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T-duality

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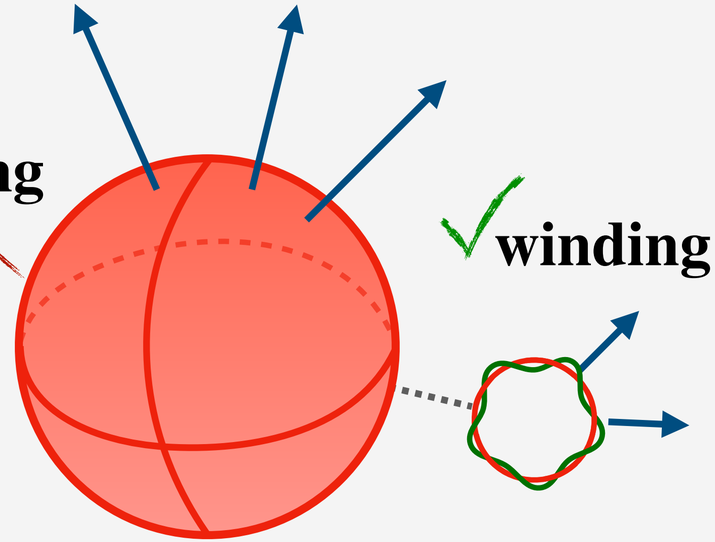


$S^2_R \times S^1_{1/R},\ H \neq 0$

Reduction on trivially fired internal space $S^1 \hookrightarrow M_n$:

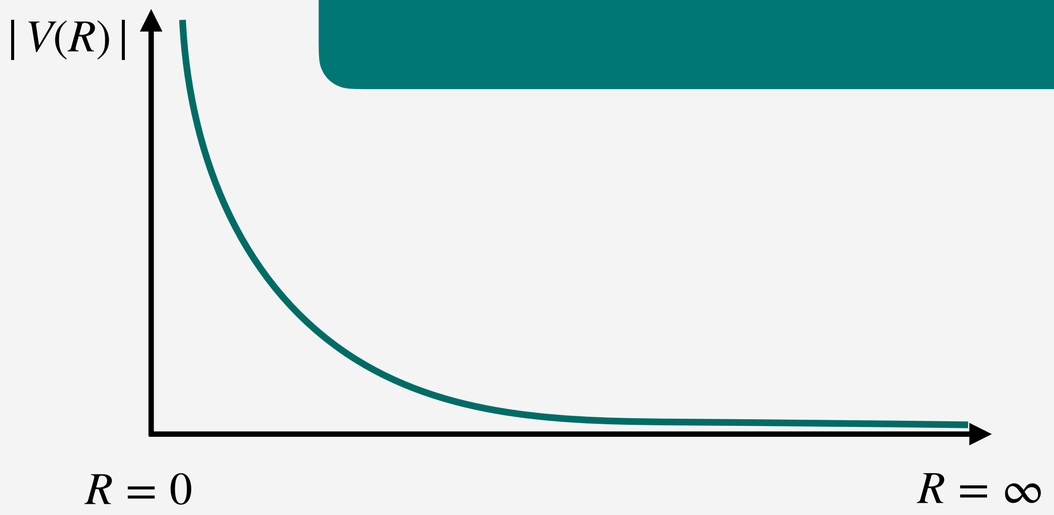
non-

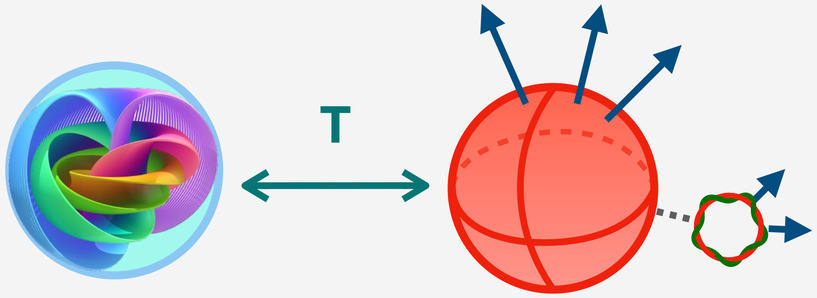
and/or in presence of fluxes

$$S_{\text{EH}} \sim \int \mathrm{d}^D x \sqrt{-g} \left(\mathscr{R}(g) - \gamma_{ij} \partial_\mu \phi^i \partial^\mu \phi^j - V(\phi^i) \right)$$

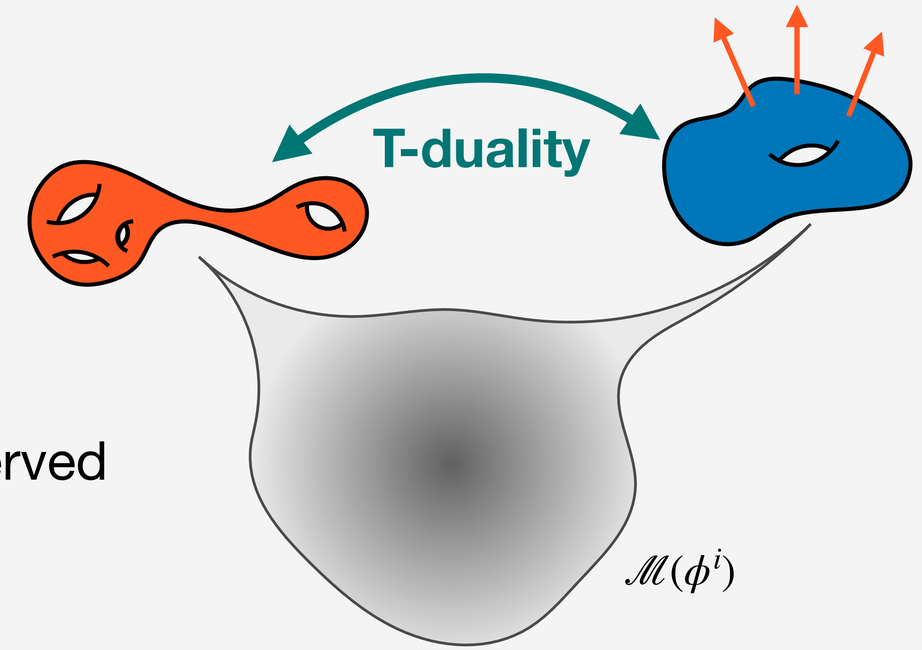
[2312.07674]

"… a divergence in the scalar potential emerges when approaching an infinite locus point for which the target space geometry cannot give rise to a light tower of states…"





Summary



- **Trivialization** of cycles, **torsionfull** cycles

  winding $\in \mathbb{Z}_n \overset{\text{T}}{\longleftrightarrow} p$ non-conserved

- **Potential** signals absence of states

- **Invariance** of metric $\gamma_{ij} = \tilde{\gamma}_{ij}$ → need to consider fluxes

- **Generalized** T-duality & **non-geometric** spaces

  Consistency requires to move to β-gravity