

Inequivalent $SO(8)$ Gauged Supergravities

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Dall'Agata, G.I., Trigiante PRL109 [1209.0760]

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SO(8) Gauged D=4, $\mathcal{N}=8$ Supergravity

Original SO(8) Maximal SUGRA

• Main vacuum: $AdS_4 \times S^7$

↳ Holographic dual to $\mathcal{N}=8$ ABJM model in 3D

- Asymptotically AdS Black Holes (via truncations)
- Top-Down AdS/CMT applications
- Test for compactification schemes

S^7 seems unique, but D=4 SO(8) SUGRA is NOT

$SO(8)_\omega$ Gauged D=4, $\mathcal{N}=8$ Supergravity

Original $SO(8)$ Theory:

De Wit, Nicolai ('82);

$$\partial_\mu \longrightarrow \partial_\mu - g \underbrace{A_\mu^\Lambda}_{28} \underbrace{t_\Lambda^{SO(8)}}_{28}$$

$SO(8)_\omega$ Gauged D=4, $\mathcal{N}=8$ Supergravity

Original $SO(8)$ Theory: $\partial_\mu \longrightarrow \partial_\mu - g \underbrace{A_\mu^\Lambda}_{28} \underbrace{t_\Lambda^{SO(8)}}_{28}$
De Wit, Nicolai ('82);

Seems unique, BUT:
use magnetic-dual vector fields:

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$$\partial_\mu \longrightarrow \partial_\mu - g(\cos \omega A_\mu^\Lambda - \sin \omega A_{\mu\Lambda}^{\text{magnetic}}) t_\Lambda^{SO(8)}$$

More precisely: Symplectic embedding of gauge diff. algebra is physically relevant!

- Consistency: guaranteed e.g. by embedding tensor formalism

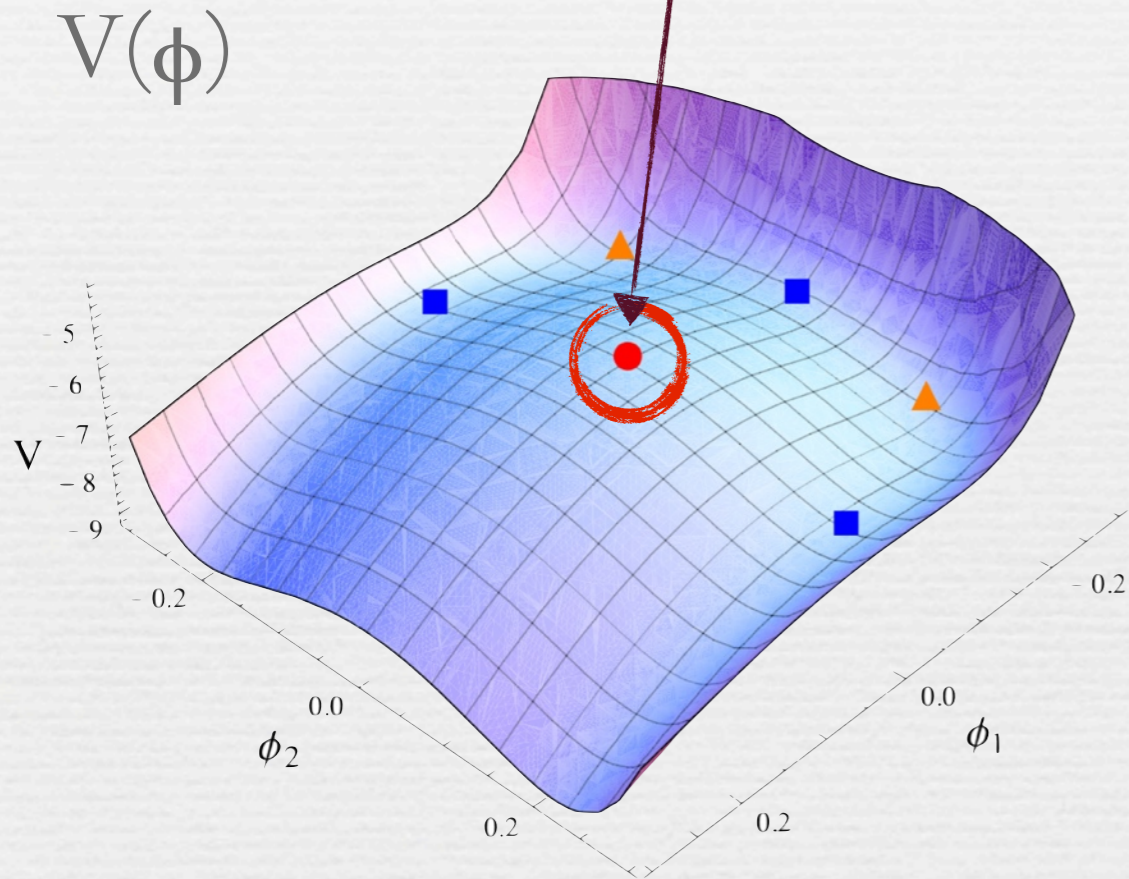
- Inequivalent for:

$$\omega \in [0, \pi/8] \quad (\rightsquigarrow S^1/D_8)$$

Vacuum structure changes with ω !

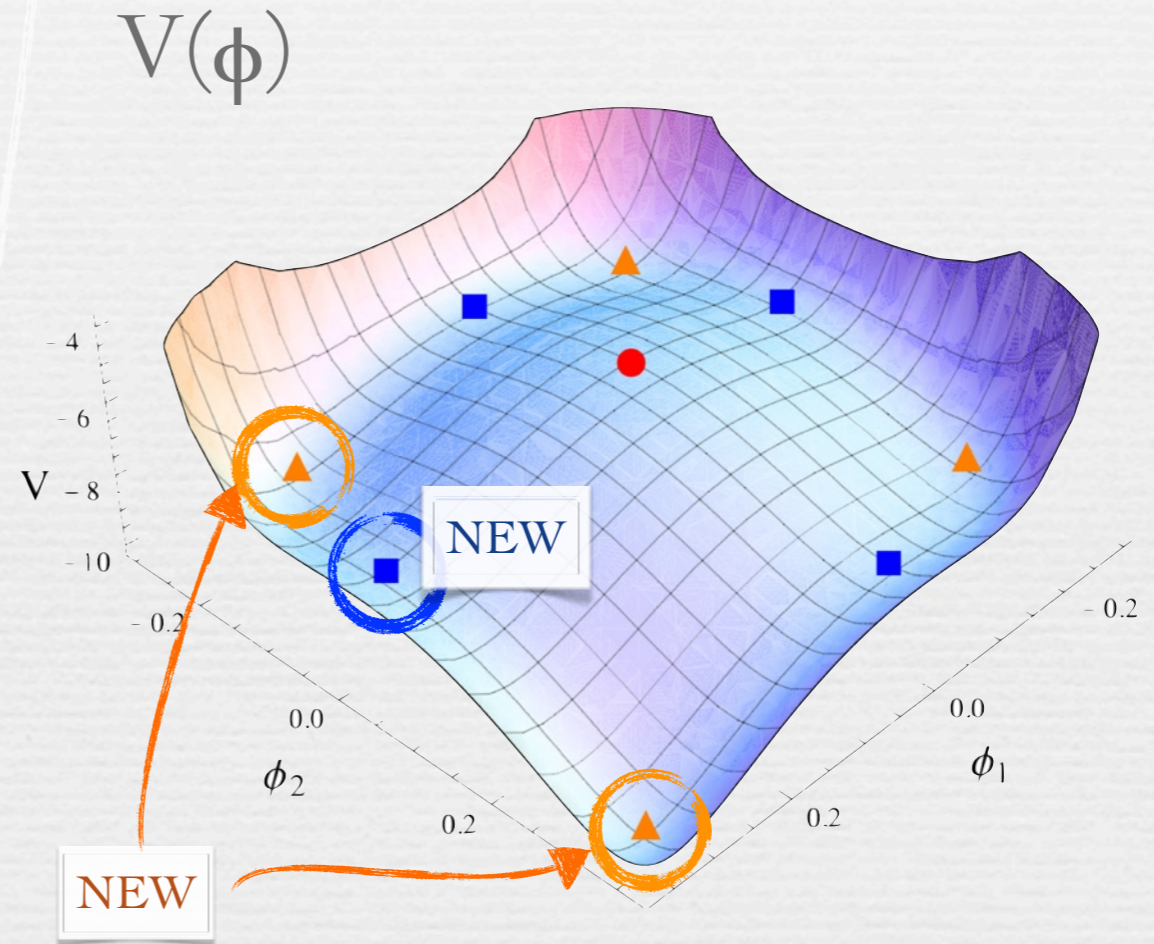
G_2 - consistent truncation: two fields ϕ_1 ϕ_2

$AdS_4 \times S^7$



$\omega=0$

de Wit, Nicolai '83;
Warner '83



$\omega=\pi/8$

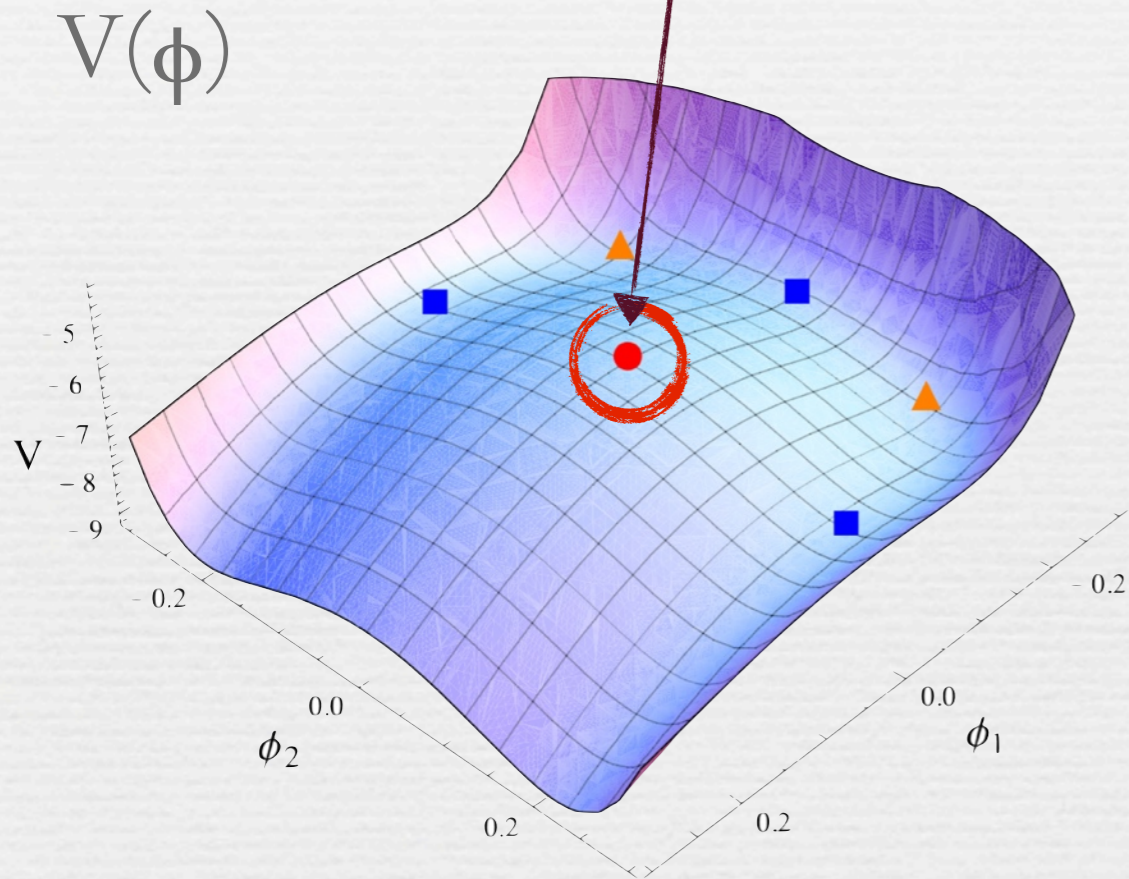
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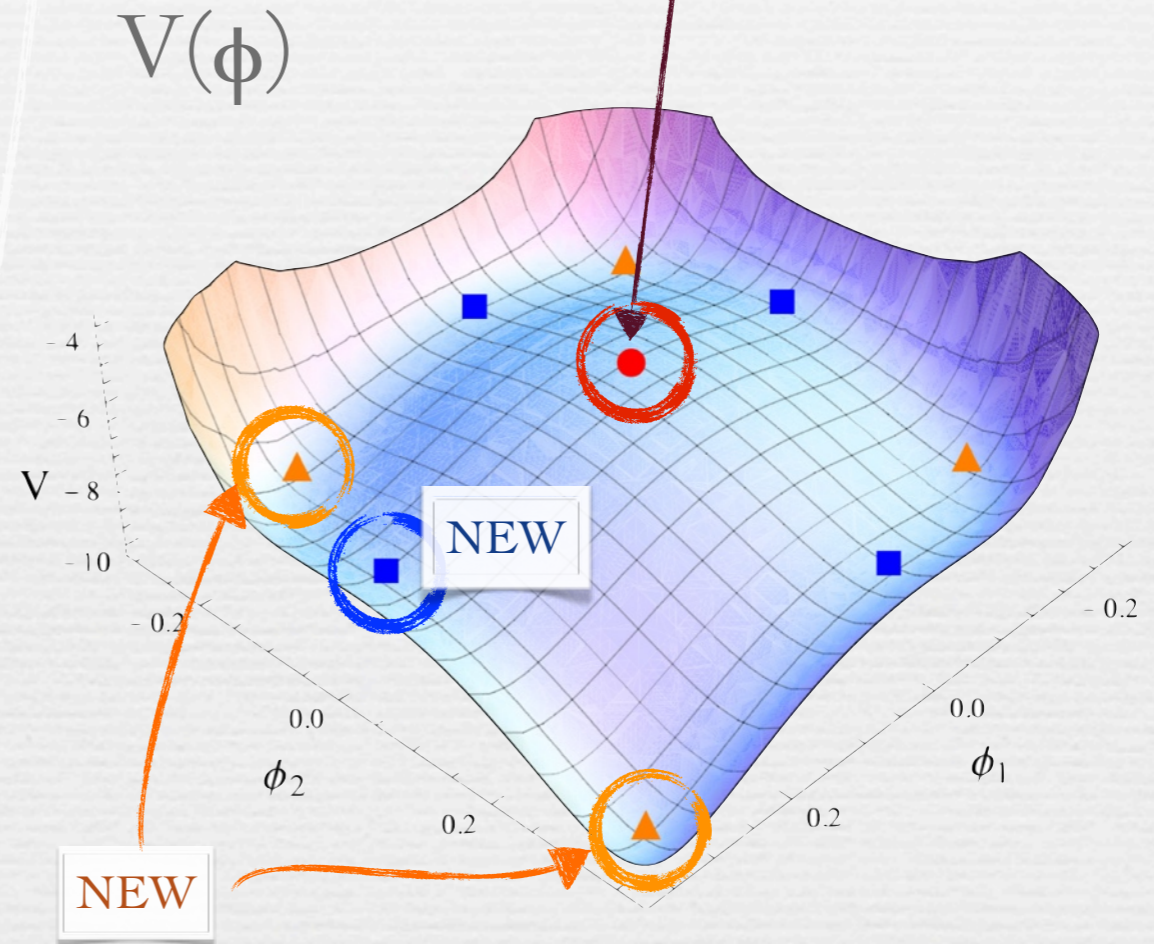
$AdS_4 \times S^7$



$\omega=0$

de Wit, Nicolai '83;
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$AdS_4 \times S^7 \dots?!?$



$\omega=\pi/8$

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$$\partial_\mu \longrightarrow \partial_\mu - g(\cos \omega A_\mu^\Lambda - \sin \omega A_{\mu\Lambda}^{\text{magnetic}}) t_\Lambda^{SO(8)}$$

11D Uplift & 3D Dual

Original $SO(8)$ SUGRA

• Main vacuum: $AdS_4 \times S^7$



- ABJM: D=3 CS matter $U(N)_k \times U(N)_{-k}$ ($\mathcal{N}=8 : k=1,2$)
- ABJ: add fractional M2s: $U(N+l)_k \times U(N)_{-k}$ ($\mathcal{N}=8 : k=2, l=1$)

Suggest: $SO(8)_{\pi/8}$ SUGRA is dual to ABJ $\mathcal{N}=8$ model

original $SO(8)_{(\omega=0)}$

$AdS_4 \times S^7, AdS_4 \times S^7/Z_2$

$SO(8)_{\pi/8}$

$AdS_4 \times S^7/Z_2 + \text{discr. torsion}$