dS in $\mathcal{N}=2$ super Liouville

(wip with D Anninos & P Benetti Genolini)

$$\mathcal{Z}_{grav} = e^{S_{dS}} - \sum_{w\ \mathrm{conf}}{}' \int [\mathcal{D}g]\, e^{-S_{EH}[\Lambda]} \qquad \mathcal{Z}_{matter} = \sum_{h\geq 0}{}' e^{\vartheta \chi_h} \mathcal{Z}^{(h)}_{grav}$$

$h=0$ $\qquad$ $h=1$

$\mathcal{N}=2$

$\downarrow \mathcal{N}=1$

$\mathcal{N}=0$

$$\mathcal{Z}^{(0)}_{grav} = \int \frac{[\mathcal{D}\Phi]}{\mathrm{vol}_{OSP(2,2\mathbb{R})}}\, e^{-S^{\mathcal{N}=2}_{tL}}$$

$$S^{\mathcal{N}=2}_{tL} = \frac{1}{4\pi}\int d^2x\sqrt{\tilde{g}}\Big[-\tilde{g}^{ij}\partial_i\varphi\partial_j\tilde{\varphi} + i\tilde{\bar{\Psi}}\not{\nabla}\Psi + \tilde{\bar{F}}F - \frac{1}{2}q\tilde{R}(\varphi+\tilde{\varphi})$$

$$+ i\Big(F\frac{\partial W}{\partial\varphi} + \frac{1}{2}\frac{\partial^2 W}{\partial\varphi^2}\bar{\Psi}\Psi\Big) + i\Big(\tilde{F}\frac{\partial\tilde{W}}{\partial\tilde{\varphi}} - \frac{1}{2}\frac{\partial^2\tilde{W}}{\partial\tilde{\varphi}^2}\tilde{\bar{\Psi}}\tilde{\Psi}\Big)\Big]$$

$\to$ Ricci scalar $\tilde{R} = \frac{2}{A}$

☆ (φ, Ψ, F), $(\tilde{\varphi}, \tilde{\Psi}, \tilde{F})$

☆ $\mathcal{N}=2$ (Timelike) Liouville

☆ Weyl of $\mathcal{N}=2$ 2D SUGRA + SCFT
$(e^a_\mu, \chi^\alpha_\mu, A_\mu)$

$\varphi + \tilde{\varphi} = 2\varphi_1$ $\qquad$ $g = \check{g}\, e^{2\beta\varphi_1}$

$\varphi - \tilde{\varphi} = 2\varphi_2$ $\qquad$ $A_\mu = \epsilon_{\mu\nu}\partial^\nu\varphi_2$

$W \sim e^{\beta\varphi}$, $\tilde{W} \sim e^{\beta\tilde{\varphi}}$

☆ EOM: $\Psi_* = 0$, $(\varphi + \check{\varphi}) = 2\varphi_1 = \frac{1}{\beta}\log\left(\frac{1}{\Lambda}\right)$

→ Spont breaking of SUSY

$$S^{\mathcal{N}=2,(2)}_{+L} = \int d^2x \sqrt{\tilde{g}}\left(-\delta\varphi_1(-\nabla^2-2)\delta\varphi_1 - \delta\varphi_2(-\nabla^2)\delta\varphi_2 + i\,\delta\bar{\Psi}\,\nabla\!\!\!/\,\Psi + i\alpha\,\delta\bar{\Psi}\delta\Psi - i\alpha^*\delta\tilde{\bar{\Psi}}\delta\tilde{\Psi} + \ldots\right)$$

$$\log Z_{grav} = 2\vartheta + \left(\frac{c_m-3}{6}\right)\log\left(\frac{1}{\Lambda}\right) + f^{(0)}(c_m)$$

SUSY localization
body terms in fields

★ $Z^{(0)}_{tL} \sim A^{\frac{c_{tL}}{6}}$, $c_{tL} = 3 - 6q^2$, $q = \beta^{-1}$

★ $S^{N=2}_{tL} = \frac{1}{4\pi}\int d^2x \sqrt{\tilde{g}}\left(-\tilde{g}^{ij}\partial_i\varphi_1\partial_j\varphi_1 - q\tilde{R}\varphi_1 + \Lambda e^{2\beta\varphi_1}\right. + \dots$

$\Lambda > 0$, $N=2$ SUSY TRANSF.

★ $c_{tL} + c_m + \underbrace{c_{gh}}_{-6} = 0$