Superconformal models with non-abelian dual fields in 6d

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Based on Samtleben, Sezgin & Wimmer, arXiv:1108.4060
and **work in progress with Igor Bandos and Henning Samtleben**

Durham, January 28, 2013

Motivation

- Understanding theory of multiple M5
  - 6d (2,0) superconformal theory with a non-abelian chiral tensor supermultiplet

$$(B_{\mu\nu}, \phi^A, \chi^i)$$

  - How to endow this chiral multiplet with non-abelian structure?
  - No free (dimensionless) parameter to make the theory weakly coupled. Does an action exist?
  - Can, at least, equations of motion be constructed?

Ways of approaching the problem

- Rewrite and reinturprete 6d theory (compactified on a circle) in terms of a 5d SYM theory
  - *Lambert & Papageorgakis + Schmidt-Sommerfeld '10; Douglas '10*
  - *Singh '11*
  - *Ho, Huang & Matsuo '11*
  - *Chu & Ko '12*
  - *Bonetti, Grimm & Hohenegger '12*
  - *Hee-Cheol Kim and Kimyeong Lee '12*
  - *...*
- Higher gauge theories, twistor space, gerbs…
  - *Kotov & Strobl '10; Saemann & Wolf '11,'12; Palmer & Saemann '12, ...*
- Construction of superconformal non-abelian tensor field theories directly in 6d
  - *Samtleben, Sezgin & Wimmer '11,+ Wulff'12;*
  - *Chu '11*
  - *Akyol & Papadopoulos '12*

Each of the approaches has its own issues (limitations)

Goals and results

- To show that a non-abelian deformation of 6d chiral tensor fields is possible
- Supersymmetrization and on-shell closer of susy algebra produces equations of motion
- Superconformal actions can be constructed for a sub-class of these models

Issues:

- restrictions on possible gauge groups
- non-maximal (1,0) 6d susy
- presence of ghosts in the action
- vector gauge fields are dynamical

Resemble issues in BLG and ABJM

- Tensor hierarchy *(de Wit & Samtleben '05)* $(A_1, B_2, C_3, C_4, \ldots)$
  - to gauge 6d (1,0) chiral multiplets $(B^I_{\mu\nu}, \phi^I, \chi^{Ii})$
  - use 6d non-abelian vector multiplet $(A^r_\mu, \lambda^{ir}, Y^{ijr})$

$\partial_\mu \to D_\mu = \partial_\mu - A_\mu{}^r T_r$ <- generators of a gauge group G

$F^r_{\mu\nu} = 2\partial_{[\mu} A^r_{\nu]} - f_{st}{}^r A^s_\mu A^t_\nu + h^r_I B^I_{\mu\nu}$

$H^I_{\mu\nu\rho} = 3D_{[\mu} B^I_{\nu\rho]} + 6d^I_{rs}(A^r_{[\mu}\partial_\nu A^s_{\rho]} - \frac{1}{3} f_{pq}{}^s A^r_{[\mu} A^p_\nu A^q_{\rho]}) + g^{Ir} C_{\mu\nu\rho r}$ additional 3-form field

$\boxed{h^r_I, g^{Ir}, d^I_{rs}, b_{Irs}}$ - constant tensors

<u>Gauge transformations:</u>

naïve:

$$\delta A^r_\mu = D_\mu \Lambda^r(x)$$

$$\delta B^I_{\mu\nu} = 2D_{[\mu}\Lambda^I_{\nu]}(x) - T^I_{rJ}\Lambda^r B^J_{\mu\nu}$$

↓

$$\delta H^I_{\mu\nu\rho} = F^r_{[\mu\nu}\Lambda^J_{\rho]} T^I_{rJ} \quad \leftrightarrow \quad D_{[\lambda} H^I_{\mu\nu\rho]} = F^r_{[\lambda\mu} B^J_{\nu\rho]} T^I_{rJ}$$

inhomogeneous gauge transformations
non-covariant Bianchi identities

extended:

$$\boxed{\begin{aligned}
&\delta A^r_\mu = D_\mu \Lambda^r(x) - h^r_I \Lambda^I_\mu \\
&\Delta B^I_{\mu\nu} = \delta B^I_{\mu\nu} - 2d^I_{rs} A^r_{[\mu}\delta A^s_{\nu]} = 2D_{[\mu}\Lambda^I_{\nu]}(x) - 2d^I_{rs}\Lambda^r F^s_{\mu\nu} - g^{Ir}\Lambda_{\mu\nu r} \\
&g^{Ir}\Delta C_{\mu\nu\rho r} = 3g^{Ir} D_{[\mu}\Lambda_{\nu\rho]r} + g^{Ir} b_{Irs}(3F^s_{[\mu\nu}\Lambda^I_{\rho]} + H^I_{\mu\nu\rho}\Lambda^s)
\end{aligned}}$$

Construction

- Covariant gauge transformations of field strengths

$$\delta F^r_{\mu\nu} = \Lambda^p T_{pq}{}^r F^q_{\mu\nu}, \qquad \delta H^I_{\mu\nu\rho} = \Lambda^p T_{pJ}{}^I H^J_{\mu\nu\rho}$$

- Bianchi identities

$$D_{[\mu} F^r_{\nu\rho]} = \tfrac{1}{4} h^r_I H^I_{\mu\nu\rho}, \quad D_{[\lambda} H^I_{\mu\nu\rho]} = \tfrac{2}{3} d^I_{rs} F^r_{[\lambda\mu} F^s_{\nu\rho]} + \tfrac{1}{4} g^{Ir} H^{(4)}_{\lambda\mu\nu\rho\, r}, \quad g^{Ir} D_{[\sigma} H^{(4)}_{\lambda\mu\nu\rho]r} = -2 g^{Ir} b_{Irs} F^r_{[\sigma\lambda} H^I_{\mu\nu\rho]}$$

- Gauge group generators and generalized Jacobi identities

$$T_{pq}{}^r = -f_{[pq]}{}^r + d^I_{(pq)} h^r_I, \qquad T_{pJ}{}^I = 2 h^s_J d^I_{sp} - g^{Is} b_{Jsp}$$

$$[T_p, T_q] = -T_{[pq]}{}^s T_s$$

$$h^r_I g^{Is} = 0$$

$$f_{[pq}{}^s f_{r]s}{}^t - \tfrac{1}{3} h^t_I d^I_{s[p} f_{qr]}{}^s = 0$$

…

…

Constraints on tensors b, d, f, g, h, T

Susy and superconformal field equations

- (1,0) supersymmetry transformations are defined by closer of the susy algebra

$$[\delta_{\varepsilon_1},\delta_{\varepsilon_2}]=\bar{\varepsilon}_1\gamma^{\mu}\varepsilon_2\partial_{\mu}+\delta_{\Lambda}+\delta_{\Lambda_{\mu}}+\delta_{\Lambda_{\mu\nu}}+\delta(eoms)$$

- susy transformations of the *off-shell* vector multiplet $(A^r_{\mu},\lambda^{ir},Y^{ijr})$

$$\delta A^r_{\mu}=-\bar{\varepsilon}\gamma_{\mu}\lambda^r$$

$$\delta\lambda^{ri}=\tfrac{1}{8}\gamma^{\mu\nu}F^r_{\mu\nu}\varepsilon^i-\tfrac{1}{2}Y^{ijr}\varepsilon_j+\tfrac{1}{4}h^r_I\phi^I\varepsilon^i$$

$$\delta Y^{ijr}=-\bar{\varepsilon}^{(i}\gamma^{\mu}D_{\mu}\lambda^{j)r}+2h^r_I\bar{\varepsilon}^{(i}\chi^{j)I}$$

- susy transformations of the tensor multiplet $(B^I_{\mu\nu},\phi^I,\chi^{Ii})$ and $C_{\mu\nu\rho r}$

$$\delta\phi^I=-\bar{\varepsilon}\chi^I$$

$$\delta\chi^{iI}=\tfrac{1}{48}\gamma^{\mu\nu\rho}H^I_{\mu\nu\rho}\varepsilon^i+\tfrac{1}{4}\gamma^{\mu}D_{\mu}\phi^I\varepsilon^i-\tfrac{1}{2}d^I_{rs}\gamma^{\mu}\lambda^{ir}\,\bar{\varepsilon}\gamma_{\mu}\lambda^s$$

$$\Delta B^I_{\mu\nu}=-\bar{\varepsilon}\gamma_{\mu\nu}\chi^I$$

$$\Delta C_{\mu\nu\rho\, r}=-b_{Irs}\bar{\varepsilon}\gamma_{\mu\nu\rho}\lambda^s\phi^I$$

C_3 does not have its own superpartners

it is expected to be dual to the vector field

- Tensor multiplet eom

$$H^I_{\mu\nu\rho} - {*H}^I_{\mu\nu\rho} = -d^I_{rs}\bar{\lambda}^r \gamma_{\mu\nu\rho}\lambda^s$$ - self-duality condition

$$\gamma^\mu D_\mu \chi^I = \tfrac{1}{4} d^I_{rs} F^r_{\mu\nu}\gamma^{\mu\nu}\lambda^s + \cdots$$

$$D^\mu D_\mu \phi^I = -\tfrac{1}{2} d^I_{rs} F^r_{\mu\nu} F^{\mu\nu s} + 3 d^I_{rs} h^r_J h^s_K\, \phi^J \phi^K + \cdots$$

- Susy variations of these produce vector multiplet eom

$$g^{Ir} b_{Jrs}(Y^s_{ij}\phi^J - 2\bar{\lambda}^s_{(i}\chi^J_{j)}) = 0$$

$$g^{Ir} b_{Jrs}(\phi^J F^s_{\mu\nu} - 2\bar{\lambda}^s \gamma_{\mu\nu}\chi^J) = \tfrac{1}{4!}\varepsilon_{\mu\nu\lambda\rho\sigma\tau} g^{Ir} H^{(4)\,\lambda\rho\sigma\tau}_r$$ - duality between A_1 and C_3

$$g^{Ir} b_{Jrs}\phi^J \gamma^\mu D_\mu \lambda^s = \cdots$$

- Superconformal invariance: $\Phi = (\phi\ , Y_{ij}, A_\mu, B_{\mu\nu}, C_{\mu\nu\rho}, \chi\ ,\ \lambda\ )$

$\Delta = (2,\ 2,\ 1,\ \ 2,\ \ 3,\ 5/2, 3/2)$ conformal weights

$\partial_{(\mu}K_{\nu)} = \Omega\eta_{\mu\nu}$ - conformal Killing vectors

$$\delta_C \Phi_p = \mathscr{L}_K \Phi_p + (\Delta - p)\Omega\Phi_p$$

Susy and superconformal field equations

- Metric in the representation space of the tensor multiplet is required

$$\tfrac{1}{2}\eta_{IJ} D_\mu \phi^I D^\mu \phi^J$$

- Additional constraints on the coupling tensors are required

$$b_{Irs} = 2\eta_{IJ} d^J_{rs}, \qquad \eta_{IJ} d^I_{p(q} d^J_{rs)} = 0, \qquad \left.\begin{array}{l} h^r_I = \eta_{IJ} g^{Jr} \\ h^r_I g^{Is} = 0 \end{array}\right\} \; g^{Ir}\eta_{IJ} g^{Is} = 0$$

metric is indefinite

- Lagrangian for $\phi, Y_{ij}, A_\mu, C_{\mu\nu\rho}$

$$L = -\tfrac{1}{2} D^\mu \phi^I D_\mu \phi^J \eta_{IJ} + \tfrac{1}{4} b_{rsI}\phi^I (F^r_{\mu\nu} F^{s\mu\nu} - 4Y^r_{ij} Y^{sij}) + \tfrac{1}{2} b_{rsI} g^r_J g^s_K \phi^I \phi^J \phi^K + L_{top}$$

$$\int_{\partial M_7} L_{top} = \int_{M_7} (b_{rsI} F^r \wedge F^s \wedge H^I - H^I \wedge DH^J \eta_{IJ})$$

$$F^r = dA^r - f^r_{st} A^s A^t + g^r_I B^I_2, \quad H^I_3 = DB^I_2 + d^I_{rs}(A^r dA^s - \tfrac{1}{3} f^r_{pq} A^s A^p A^q) + g^{Ir} C_{3r}$$

Action

Action

- Action for the self-dual field B_2 $\boxed{H_3 = {}^*H_3}$
- Abelian case *(Henneaux & Teitelboim '87, Perry & Schwarz '96, Pasti, D.S. & Tonin '96)*

$$H_3 = dB_3$$

$$L_{HH} = -\tfrac{1}{6} H_{\mu\nu\lambda} H^{\mu\nu\lambda} - \tfrac{1}{2} \upsilon^\mu (H - {}^*H)_{\mu\nu\lambda} (H - {}^*H)^{\nu\lambda\rho} \upsilon_\rho \,, \qquad \boxed{\upsilon_\mu(x):\ \upsilon_\mu \upsilon^\mu = -1,\ \upsilon_\mu = \frac{\partial_\mu a(x)}{\sqrt{-\partial_\mu a \partial^\mu a}}}$$

- Local gauge symmetries:

$$\delta B_{\mu\nu} = \partial_{[\mu} \Lambda_{\nu]}(x)$$

$\delta B_{\mu\nu} = \upsilon_{[\mu} \Phi_{\nu]}(x) \ \rightarrow\ \upsilon^\mu B_{\mu\nu}$ is pure gauge d.o.f. (enters Lagrangian under a total derivative)

$\delta a(x) = \varphi(x), \quad \delta B_{\mu\nu} = \dfrac{\varphi(x)}{\sqrt{-(\partial a)^2}} (H - {}^*H)_{\mu\nu\lambda} \upsilon^\lambda \ \longrightarrow$ gauge fixing: $a(x) = x^0, \ \upsilon_\mu = \delta^0_\mu$

- Alternative form of the Lagrangian and equations of motion:

$$L_{HH} = -\tfrac{1}{8} \upsilon^\mu \, {}^*H_{\mu\nu\lambda} (H - {}^*H)^{\nu\lambda\rho} \upsilon_\rho$$

$$\frac{\delta L_{HH}}{\delta B_{\mu\nu}} = \varepsilon^{\mu\nu\rho\sigma\lambda\tau} \partial_\rho \left[\upsilon_\sigma (H - {}^*H)_{\lambda\tau\kappa} \upsilon^\kappa \right] = 0 = d \wedge \upsilon \wedge i_\upsilon (H - {}^*H) \ \Rightarrow\ \upsilon \wedge i_\upsilon (H - {}^*H) = d(\upsilon \wedge \Phi_1)$$

$$\downarrow$$

$$\boxed{H_3 - {}^*H_3 = 0}$$

- Non-Abelian action *(Bandos, Samtleben & D.S. in preparation)*

$$L=-\tfrac{1}{8}\upsilon^{\mu} * H_{\mu\nu\lambda}(H-*H)^{\nu\lambda\rho}\upsilon_{\rho}+\tfrac{1}{4}b_{rsI}\phi^{I}(F^{r}_{\mu\nu}F^{s\mu\nu}-4Y^{r}_{ij}Y^{sij})+L_{\phi}+L_{top}$$

$$L_{\phi}=-\tfrac{1}{2}D^{\mu}\phi^{I}D_{\mu}\phi^{J}\eta_{IJ}+\tfrac{1}{2}b_{rsI}g^{r}_{J}g^{s}_{K}\phi^{I}\phi^{J}\phi^{K}$$

no kientic term for C_3

$$\int_{\partial M_7} L_{top}=\int_{M_7}(b_{rsI}F^{r}\wedge F^{s}\wedge H^{I}-H^{I}\wedge DH^{J}\eta_{IJ})$$

- Symmetries

$$\delta a(x)=\varphi(x),\quad \delta B_{\mu\nu}=\frac{\varphi(x)}{\sqrt{-(\partial a)^2}}(H-*H)_{\mu\nu\lambda}\upsilon^{\lambda},\quad \delta C_{\mu\nu\rho r}=-\frac{\varphi(x)}{\sqrt{-(\partial a)^2}}(H^{(4)}_{\mu\nu\rho\sigma r}-*F^{s}_{\mu\nu\rho\sigma}b_{Isr}\phi^{I})\upsilon^{\sigma}$$

$$\delta B^{I}_{\mu\nu}\neq\upsilon_{[\mu}\Phi^{I}_{\nu]}(x)\quad\text{but}\quad \delta B^{I}_{\mu\nu}=g^{Ir}\upsilon_{[\mu}\Phi_{\nu]r}(x),\quad \delta C_{\mu\nu\rho r}=\upsilon_{[\mu}\Phi_{\nu\rho]r}(x)$$

Action

- Variation with respect to C_3, B_2, A_1 and $a(x)$

$$\begin{aligned}\delta L = {} & \Delta C_{3r} \wedge g_I^r i_\upsilon (H^I - {*H^I}) \wedge \upsilon \\ & + \Delta B_2^I \wedge D\big[i_\upsilon (H^I - {*H^I}) \wedge \upsilon\big] + \Delta B_2^I \wedge g_I^r (H_{4r} - {*F^s} b_{srJ} \phi^J) \\ & + \delta A_1^r \wedge F^s \wedge i_\upsilon (H^I - {*H^I}) \wedge \upsilon\, b_{srI} \\ & + \delta A_1^r \wedge [b_{srI} H^I \wedge F^s + h_{[I}^s b_{J]sr} \phi^I * D\phi^J - D({*F^s} b_{srJ} \phi^J)] \\ & + \tfrac{1}{2} \delta a\, d \left[i_\upsilon (H^I - {*H^I}) \wedge i_\upsilon (H_I - {*H_I}) \wedge \frac{da}{\partial_\mu a \partial^\mu a} \right]\end{aligned}$$

demonstrates how tensor hierarchy works

Action and equations of motion

Supersymmetry of the action

Modified off-shell susy transformations

- susy transformations of the off-shell vector multiplet $(A_\mu^r, \lambda^{ir}, Y^{ijr})$

$$\delta A_\mu^r = -\bar{\varepsilon}\gamma_\mu \lambda^r$$

$$\delta \lambda^{ri} = \tfrac{1}{8}\gamma^{\mu\nu} F_{\mu\nu}^r \varepsilon^i - \tfrac{1}{2} Y^{ijr}\varepsilon_j + \tfrac{1}{4} h_I^r \phi^I \varepsilon^i$$

$$\delta Y^{ijr} = -\bar{\varepsilon}^{(i}\gamma^\mu D_\mu \lambda^{j)r} + 2h_I^r \bar{\varepsilon}^{(i}\chi^{j)I}$$

- susy transformations of the tensor multiplet $(B_{\mu\nu}^I, \phi^I, \chi^{Ii})$ and $C_{\mu\nu\rho r}$

$$\delta\phi^I = -\bar{\varepsilon}\chi^I$$

$$\delta\chi^{iI} = \tfrac{1}{48}\gamma^{\mu\nu\rho} H_{\mu\nu\rho}^I \varepsilon^i + \tfrac{1}{4}\gamma^\mu D_\mu \phi^I \varepsilon^i - \tfrac{1}{2} d_{rs}^I \gamma^\mu \lambda^{ir}\, \bar{\varepsilon}\gamma_\mu \lambda^s \boxed{+\tfrac{1}{48}\gamma^{\mu\nu\lambda}\upsilon_\mu (H^I - *H^I)_{\nu\lambda\rho}\upsilon^\rho \varepsilon^i}$$

$$\Delta B_{\mu\nu}^I = -\bar{\varepsilon}\gamma_{\mu\nu}\chi^I$$

$$\Delta C_{\mu\nu\rho\, r} = -b_{Irs}\bar{\varepsilon}\gamma_{\mu\nu\rho}\lambda^s \phi^I$$

susy deformation is due to the structure of self-dual action:

$$L_{HH} = -\tfrac{1}{6} H_{\mu\nu\lambda}H^{\mu\nu\lambda} - \tfrac{1}{2}\upsilon^\mu (H - *H)_{\mu\nu\lambda}(H - *H)^{\nu\lambda\rho}\upsilon_\rho\,, \qquad H_3 = DB_2 + AdA + AAA + C_3$$

- *Samtleben et. al. '11,'12; Chong-Sung Chu '11*
- Minimal non-Lagrangian model: $g^{Ir}=0=b_{Irs}$

$$F^r=dA^r-f_{st}^{\ r}A^sA^t+h_I^rB_2^I,\quad H_3^I=DB_2^I+d_{rs}^I(A^rdA^s-\tfrac{1}{3}f_{pq}^{\ r}A^sA^pA^q)+\cancel{g^{Ir}}C_{3r}$$

$$\boxed{\begin{array}{l} A^r=(A^\alpha,\mathcal{A}^I),\quad B_2^I \\ f_{st}^{\ \ r}\ \to\ f_{\alpha\beta}^{\ \ \gamma},\ (T_\alpha)_I^{\ J}\qquad f_{\alpha\beta}^{\ \ \gamma}\ \text{- structure constants (generators) of } adj\ G \\ d_{rs}^I\ \to\ (T_\alpha)_I^{\ J}\ \text{- generators of some representation of G} \\ h_I^r\ \to\ \delta_I^J \end{array}}$$

$$F^r:\quad F^\alpha=dA^\alpha-f_{\beta\gamma}^{\ \ \alpha}A^\beta A^\gamma,\quad \mathcal{B}_2^I=d\mathcal{A}^I-A^\alpha T_{\alpha J}^{\ \ I}\mathcal{A}^J+B_2^I=D\mathcal{A}^I+B_2^I$$

$$H_3^I=D\mathcal{B}_2^I$$

- Equations of motion imposed by susy

$$(H^I-{*H^I})_{\mu\nu\rho}=T_{\alpha J}^{\ \ I}\bar{\lambda}^\alpha\gamma_{\mu\nu\rho}\lambda^I,\qquad F_{\mu\nu}^\alpha\ \text{- remains on-shell}$$

Examples of gauge field strcuture

- Minimal Lagrangian model

$$A^r=(A^\alpha,\mathcal{A}^I),\quad B_2^{\hat I}=(B_2^I,B_{2J}),\quad C_{3J}$$ upper and lower I, J label inequivalent reps.

$$f_{st}{}^r \to f_{\alpha\beta}{}^\gamma,\ (T_\alpha)_I{}^J \qquad f_{\alpha\beta}{}^\gamma \text{ - structure constants (generators) of } adj\, G$$

$$d_{rs}^{\hat I}=\eta^{\hat I\hat J}b_{\hat J rs} \to (T_\alpha)_I{}^J \text{ - generators of some representation of } G$$

- field strengths

$$F^r:\quad F^\alpha=dA^\alpha-f_{\beta\gamma}{}^\alpha A^\beta A^\gamma,\quad \mathcal{B}_2^I=d\mathcal{A}^I-A^\alpha T_{\alpha J}{}^I\mathcal{A}^J+B_2^I=D\mathcal{A}^I+B_2^I$$

$$H_3{}^{\hat I}:\quad H_3^I=D\mathcal{B}_2^I,\quad \mathcal{C}_{3I}=DB_{2I}+C_{3I},\quad H_{4I}=D\mathcal{C}_{3I}$$

- Lagrangian (*of BF-type*)

$$L=-\tfrac{1}{2}D^\mu\phi_I D_\mu\phi^I+T_{\alpha I}{}^J\phi_J\mathcal{B}^I_{\mu\nu}F^{\mu\nu\alpha}+\tfrac{1}{2}(\mathcal{C}+*\mathcal{C})^{\mu\nu\rho}{}_I D_\mu\mathcal{B}^I_{\nu\rho}$$

- Equations of motion: $H_3^I=*H_3^I,\qquad T_{\alpha I}{}^J\phi_J F^{\mu\nu\alpha}=\tfrac{1}{2}D_\mu(\mathcal{C}+*\mathcal{C})^{\mu\nu\rho}{}_I=*H^{\mu\nu+}_{(4)I}$

$$T_{\alpha I}{}^J D_\mu(\phi_J\mathcal{B}^{\mu\nu I})=\tfrac{1}{2}T_{\alpha I}{}^J\left((\mathcal{C}+*\mathcal{C})^{\mu\nu\rho}{}_J\mathcal{B}^I_{\nu\rho}+\phi_J D^\nu\phi^I+\phi^I D^\nu\phi_J\right),\ D^\mu D_\mu\phi_I=0,\ D^\mu D_\mu\phi^I=\ldots$$

Examples of gauge field strcuture

- A wide class of 6d (1,0) superconformal models of non-abelian tensor multiplets has been constructed *(with highly restrictive constraints on possible gauge structure)*
  - *Akyel & Papadopoulos '12* studied BPS solutions and their string/brane interpretation
  - resently *Samtleben, Sezgin & Wimmer '12* coupled these models to (1,0) hypermultiplets which together with the (1,0) tensor multiplets form the field content of a non-abelian (2,0) tensor multiplet (which one might be tempted to associate with the dofs of multiple M5).
- Key question: may some of these models have something to do with the (2,0) theory of multiple M5-branes?
- Issues to be resolved
  - presence of redundent dofs - vector gauge fields are dynamical
  - presence of ghosts in the action
- To study relation to other proposals of non-abelian 6d chiral tensor models and 5d SYM. Can this give us a further hint at which direction to move?

Conclusion