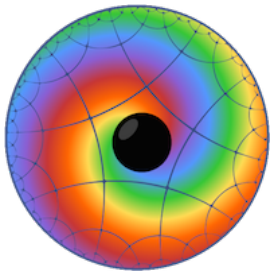

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Rigid Holography and the 6D (2,0) CFT on AdS_5*S^1

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Field theories on anti-de Sitter (AdS) space can be studied by realizing them as low-energy limits of AdS vacua of string/M theory. In an appropriate limit, the field theories decouple from the rest of string/M theory. Since these vacua are dual to conformal field theories, this relates some of the observables of these field theories on anti-de Sitter space to a subsector of the dual conformal field theories. We exemplify this rigid holography' by studying in detail the six-dimensional $calN = (2,0)$ A_{K-1} superconformal field theory (SCFT) on $AdS_5 \times \mathbb{S}^1$, with equal radii for AdS_5 and for $\mathbb{S}^1$. We choose specific boundary conditions preserving sixteen supercharges that arise when this theory is embedded into Type IIB string theory on $AdS_5 \times \mathbb{S}^5/\mathbb{Z}_K$. On $\mathbb{R}^{4,1} \times \mathbb{S}^1$, this six-dimensional theory has a $5(K-1)$-dimensional moduli space, with unbroken five-dimensional $SU(K)$ gauge symmetry at (and only at) the origin. On $AdS_5 \times \mathbb{S}^1$, the theory has a $2(K-1)$-dimensionalmoduli space' of supersymmetric configurations. We argue that in this case the $SU(K)$ gauge symmetry is unbroken everywhere in the moduli space' and that this five-dimensional gauge theory is coupled to a four-dimensional theory on the boundary of AdS_5 whose coupling constants depend on themoduli'. This involves non-standard boundary conditions for the gauge fields on AdS_5. Near the origin of the moduli space', the theory on the boundary contains a weakly coupled four-dimensional $calN = 2$ supersymmetric $SU(K)$ gauge theory. We show that this implies large corrections to the metric on themoduli space'. The embedding in string theory implies that the six-dimensional $calN = (2,0)$ theory on $AdS_5 \times \mathbb{S}^1$ with sources on the boundary is a subsector of the large N limit of various four-dimensional $calN = 2$ quiver SCFTs that remains non-trivial in the large N limit. The same subsector appears universally in many different four-dimensional $calN = 2$ SCFTs. We also discuss a decoupling limit that leads to $calN = (2,0)$ 'little string theories' on $AdS_5 \times \mathbb{S}^1$.

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