Unipotent vector bundles and higher-order non-holomorphic Eisenstein series

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Abstract. Higher-order non-holomorphic Eisenstein series associated to a Fuchsian group $\Gamma$ are defined by twisting the series expansion for classical non-holomorphic Eisenstein series by powers of modular symbols. Their functional identities include multiplicative and additive factors, making them distinct from classical Eisenstein series. In this article we prove the meromorphic continuation of these series and establish their functional equations which relate values at $s$ and $1 - s$. In addition, we construct high rank vector bundles $V$ from certain unipotent representations $\pi$ of $\Gamma$ and show that higher-order non-holomorphic Eisenstein series can be viewed as components of certain eigensections, $E$, of $V$. With this viewpoint the functional identities of these higher-order series are formally identical to the classical case. Going further,
we prove bounds on the Fourier coefficients of the higher-order non-holomorphic Eisenstein series.

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