1056-35-902 **Stephen McDowall*** (stephen.mcdowall@wwu.edu), Department of Mathematics, 516 High Street, MS 9063, Bellingham, WA 98225-9063. *Inverse transport theory and optical tomography for media with varying index of refraction.*

Optical tomography is the use of near-infrared light to determine the optical absorption and scattering properties of a medium. In the stationary Euclidean setting the dynamics are modeled by the radiative transport equation, which assumes that in the absence of interaction particles follow straight lines. Here we consider the problem in the presence of a (simple) Riemannian metric where particles follow the geodesic flow of the metric. This non-Euclidean geometry models a medium which has a continuously varying refractive index. We will present uniqueness results for two types of measurements: (1) angularly-dependent measurements and (2) the case where the information available at the boundary is averaged over angle. We show that knowledge of the albedo operator, that which maps incoming flux to outgoing flux at the boundary, uniquely determines the absorption and scattering properties of the medium. We also characterize the non-uniqueness present in the problem when the absorption is allowed to depend on direction as well as position. (Received September 18, 2009)