

On generalized Berwald manifolds of dimension three

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Abstract. A linear connection on a Finsler manifold is called compatible with the Finsler function if its parallel transports preserve the Finslerian length of tangent vectors. Generalized Berwald manifolds are Finsler manifolds equipped with a compatible linear connection. In the paper, we present a general and intrinsic method to characterize the compatible linear connections on a Finsler manifold of dimension three. We prove that if a compatible linear connection is not unique, then the indicatrices must be Euclidean surfaces of revolution. The surplus freedom of choosing compatible linear connections is related to Euclidean symmetries. The unicity of the solution of the compatibility equations can be provided by some additional requirements. Following the idea in [11], we are also looking for the so-called extremal compatible linear connection minimizing the norm of its torsion at each point of the manifold.

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Mathematics Subject Classification: 53C60, 58B20.

Key words and phrases: Finsler spaces, generalized Berwald spaces, intrinsic geometry, extremal compatible linear connections.