

## SOME RESULTS ON SUBMANIFOLDS OF A $\alpha$ -COSYMPLECTIC MANIFOLD WITH TORQUED VECTOR FIELD

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(Received: Sep. 21, 2024 Accepted: Mar. 21, 2025 Published: Apr. 30, 2025)

**Abstract:** In this paper, we examine a submanifold  $N$  of an  $\alpha$ -cosymplectic manifold equipped with a torqued vector field  $\tau$ . We also investigate submanifolds that admit a  $*\eta$ -Ricci soliton within the framework of  $\alpha$ -cosymplectic manifolds with torqued vector field  $\tau$ . We establish the necessary conditions for such a submanifold to reduce to a simpler form and demonstrate that the tangential component of  $\tau$  acts as a torse-forming vector field on  $N$ . Finally, we present an example of a 3-dimensional submanifold of a 5-dimensional  $\alpha$ -cosymplectic manifold which verifies our results.

**Keywords and Phrases:**  $\alpha$ -cosymplectic manifold,  $*\eta$ -Ricci soliton, Torqued vector field.

**2020 Mathematics Subject Classification:** 53C15, 53C25, 53C17, 53D15, 53D10.

### 1. Introduction

The study of manifolds is highly regarded by geometers and physicists for its broad applications in geometry, physics, and relativity. By examining manifolds, geometers have utilized two essential tools-the Riemannian curvature tensor and the Ricci tensor-to understand their differential geometric properties. Over time, these tools have enabled the introduction of several new concepts to describe complex structures. One such concept is the  $*\text{-Ricci}$  tensor  $S^*$ , initially introduced by