

# A new class of metric $f$ -manifolds

PABLO ALEGRE<sup>1</sup>, LUIS M. FERNÁNDEZ<sup>2</sup> and ALICIA PRIETO-MARTÍN<sup>2</sup>

## ABSTRACT.

We introduce a new general class of metric  $f$ -manifolds which we call (almost) trans- $S$ -manifolds and includes  $S$ -manifolds,  $C$ -manifolds,  $s$ -th Sasakian manifolds and generalized Kenmotsu manifolds studied previously. We prove their main properties and we present many examples which justify their study.

## REFERENCES

- [1] Bhatt, L. and Dube, K. K., *Semi-invariant submanifolds of  $r$ -Kenmotsu manifolds*, Acta Cienc. Indica Math., **29** (2003), No. 1, 167–172
- [2] Blair, D. E., *Geometry of manifolds with structural group  $\mathcal{U}(n) \times \mathcal{O}(s)$* , J. Differential Geom., **4** (1970), 155–167
- [3] Blair, D. E., *Riemannian Geometry of Contact and Symplectic Manifolds*, 2nd. Ed., Progress in Mathematics, Vol. 209, Birkhäuser, New York, 2010
- [4] Blair, D. E and Oubiña, J. A., *Conformal and related changes of metric on the product of two almost contact metric manifolds*, Publ. Mat., **34** (1990), 199–207
- [5] Falcitelli, M. and Pastore, A. M.,  *$f$ -structures of Kenmotsu type*, *Mediterr. J. Math.*, **3** (2006), 549–564
- [6] Fernández, L. M., *Variedades con  $K$ -estructuras. Subvariedades*, Ph. D. Thesis, University of Sevilla, Sevilla, 1987
- [7] Goldberg, S. I. and Yano, K., *On normal globally framed  $f$ -manifolds*, *Tohoku Math. J.*, **22** (1970), No. 2, 362–370
- [8] Hasegawa, I., Okuyama, Y. and Abe, T., *On  $p$ -th Sasakian manifolds*, *J. Hokkaido Univ. Educ. Nat. Sci. Section II A*, **37** (1986), No. 1, 1–16
- [9] Olszak, Z., *Curvature properties of quasi-Sasakian manifolds*, *Tensor (N.S.)*, **38** (1982), 19–28
- [10] O'Neill, B., *Semi-Riemannian Geometry with Applications to Relativity*, Pure and Applied Mathematics, Vol. 103, Academic Press, New York, 1983
- [11] Oubiña, J. A., *New classes of almost contact metric structures*, *Publ. Mat.*, **32** (1985), 187–193
- [12] Suguri, S. and Nakayama, S.,  *$D$ -conformal deformations on almost contact metric structure*, *Tensor (N.S.)*, **28** (1974), 125–129
- [13] Tanno, S., *The topology of contact Riemannian manifolds*, *Illinois J. Math.*, **12** (1968), 700–717
- [14] Turgut Vanlı, A. and Sari, R., *Generalized Kenmotsu manifolds*, *Comm. Math. Appl.*, **7** (2016), No. 4, 311–328
- [15] Yano, K., *On a structure defined by a tensor field  $f$  of type (1,1) satisfying  $f^3 + f = 0$* , *Tensor*, **14**, (1963), 99–109

DEPARTAMENTO DE ECONOMÍA

MÉTODOS CUANTITATIVOS E HISTORIA DE LA ECONOMÍA

UNIVERSIDAD PABLO DE OLAVIDE, CTRA. DE UTRERA, KM. 1

41013 SEVILLA, SPAIN

E-mail address: psalerue@upo.es

Received: 15.01.2018; In revised form: 30.05.2018; Accepted: 06.06.2018

2010 Mathematics Subject Classification. 53C15, 53C25, 53C99.

Key words and phrases. Almost trans- $S$ -manifold, trans- $S$ -manifold, generalized  $D$ -conformal deformation, warped product.

Corresponding author: Luis M. Fernández; lmfer@us.es

DEPARTAMENTO DE GEOMETRÍA Y TOPOLOGÍA  
FACULTAD DE MATEMÁTICAS  
UNIVERSIDAD DE SEVILLA  
C./ TARFIA, S.N. 41012 SEVILLA, SPAIN.  
*E-mail address:* lmfer@us.es  
*E-mail address:* aliciaprieto@us.es