



International  
Scientific Conference

# Algebraic and Geometric Methods of Analysis

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## LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric problems in mathematical analysis
- Geometric and topological methods in natural sciences

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ІНТЕРНАЦІОНАЛЬНИЙ ЦЕНТР СПІВРОБІТНИЦТВА

## Foliations of 3-manifolds with small module of mean curvature

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A taut foliation is a codimension one transversely oriented foliation of an oriented 3-manifold  $M$  with the property that for each leaf there is a transverse circle intersecting it.

D. Sullivan proved that  $\mathcal{F}$  is taut iff each leaf is a minimal surface for some Riemannian metric on  $M$  which is equivalent that  $\mathcal{F}$  does not contain generalized Reeb components [1]. Recall that a surface  $F$  is called minimal if the mean curvature  $H$  of  $F$  is identically zero.

In the present work we announce the following result.

**Theorem 1** (Main theorem). *Let  $(M, g)$  be a closed oriented Riemannian 3-Manifold satisfying the following properties:*

- (1) *the volume  $Vol(M, g) \leq V_0$ ;*
- (2) *the sectional curvature  $\gamma$  of  $(M, g)$  satisfies  $\gamma \leq \gamma_0$  for the constant  $\gamma_0 \geq 0$ ;*
- (3)  *$\min\{inj(M, g), \frac{\pi}{2\sqrt{\gamma_0}}\} \geq i_0$ .*

*Then there is a constant  $H_0(V_0, \gamma_0, i_0)$  such that any transversally oriented foliation  $\mathcal{F}$  of codimension one on  $M$  with the mean curvature of the leaves satisfying  $|H| < H_0$ , must be taut. The constant  $H_0$  is defined as following:*

$$H_0 = \begin{cases} \min\left\{\frac{2\sqrt{3}i_0^2}{V_0}, \sqrt[3]{\frac{2\sqrt{3}}{V_0}}\right\}, & \text{if } \gamma_0 = 0, \\ \min\left\{\frac{2\sqrt{3}i_0^2}{V_0}, x_0\right\}, & \text{if } \gamma_0 > 0, \end{cases} \quad (*)$$

where  $x_0$  is the positive root of the equation

$$\frac{4}{\gamma_0} \operatorname{arccotg}^2 \frac{x}{\sqrt{\gamma_0}} - \frac{2V_0}{\sqrt{3}} x = 0.$$

Let us recall that, by the Novikov's theorem [2], if  $\pi_1(M) < \infty$  or  $\pi_2(M) \neq 0$ , then excepting the foliation of  $S^2 \times S^1$  by spheres,  $\mathcal{F}$  contains a Reeb component. Thus we obtain the following corollary.

**Corollary 2.** *Let  $(M, g)$  be a Riemannian manifold that satisfies the properties in the theorem above. If  $\pi_1(M) < \infty$  or  $\pi_2(M) \neq 0$ , then excepting the foliation of  $S^2 \times S^1$  by spheres,  $(M, g)$  does not admit a foliation with the mean curvature  $H$  of leaves satisfying the inequality  $|H| < H_0$ , where  $H_0$  is determined from (\*).*

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