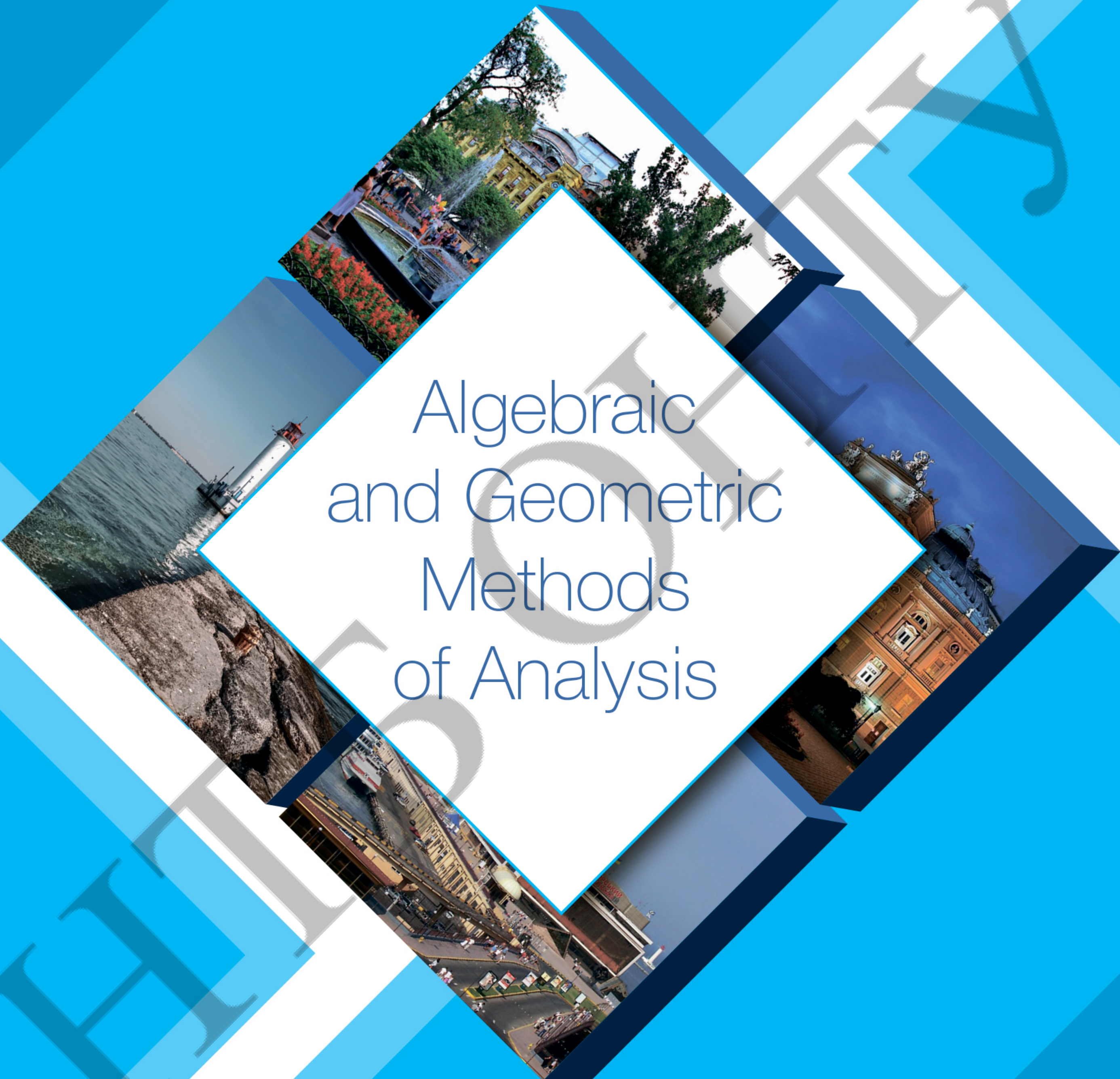
International
Scientific Conference



# Algebraic and Geometric Methods of Analysis

27-30 May 2024

Odesa, Ukraine

The purpose of this conference is to bring together researchers in geometry, topology, algebra, analysis and dynamical systems and to provide for them a forum to present their recent work to colleagues from different nationalities. This way we aim to stimulate discussion about the latest findings in geometrical and topological methods in analysis and to increase international collaboration.

The conference continues the traditional annual conference «Geometry in Odesa» holding from 2004, and hosted by Odesa National University of Technology (Odesa National Academy of Food Technologies till 2021). From 2017 the conference was renamed to «Algebraic and geometric methods of analysis» (AGMA).

The Conference languages: Ukrainian and English.

## 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 and topological methods in natural sciences
- Geometric problems in mathematical analysis

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*and $f : N^{4n} \longrightarrow M^{4n}$ a $Q^n$-equivariant homotopy equivalence. Then $f$ is $Q^n$-homotopic to a $Q^n$-homeomorphism.*

The proof of the main theorem follows the methods of [6] and [5].

- We show that the action on $N^n$ is locally regular. For this result, we first prove that $N^n$ has the same isotropy groups as $M^n$ and $f$ is an isovariant homotopy equivalence. Then we prove that the action on $N^n$ is locally regular. That is quite different from the torus case. The reason is that this part depends on the representation theory of the underlying group. But $Q^n$ is not abelian and thus its representation theory is more complicated that that of $T^n$. So, we need a more thorough analysis in this case.
- Let $Y$ be the quotient manifold with corners of the action. We prove that $N^n$ is $Q^n$-homeomorphic with the standard model constructed from $Y$. For this, there is an obstruction theory analogous to the torus case.
- The rest is standard. The map $f$ induces a face preserving homotopy equivalence $\phi : Y \longrightarrow X$. Induction and standard surgery methods imply that $\phi$ is face homotopic to a face homeomorphism $\psi$. The map $\psi$ induces a $Q^n$-homeomorphism $g : N^n \longrightarrow M^n$ that is homotopic to $f$.

## References


[1] Buchstaber, Victor M.; Panov, Taras E. *Torus actions and their applications in topology and combinatorics.* University Lecture Series, 24. American Mathematical Society, Providence, RI, 2002.

[2] Davis, Michael W. *Groups generated by reflections and aspherical manifolds not covered by Euclidean space.* Ann. of Math. (2) 117 (1983), no. 2, 293?324.

[3] Davis, Michael W.; Januszkiewicz, Tadeusz *Convex polytopes, Coxeter orbifolds and torus actions.* Duke Math. J. 62 (1991), no. 2, 417?451.

[4] Hopkinson, Jeremy *Quoric Manifolds.* PhD Thesis, University of Manchester, School of Mathematics, 2012.

[5] Metaftsis, Vassilis; Prassidis, Stratos, *Topological rigidity of quasitoric manifolds.* Math. Scand. 122 (2018), no. 2, 179-196.

[6] Prassidis, Stratos; Spieler, Barry, *Rigidity of Coxeter groups.* Trans. Amer. Math. Soc. 352 (2000), no. 6, 2619-2642.


# On the multiplicative order convergence on Banach lattice $f$-algebras


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Let $E$ ,$F$ be Archimedean vector lattices.The Fremlin tensor product $E\overline{\bigotimes}F$ of $E$ and $F$ was introduced by Fremlin in [6]. $E\overline{\bigotimes}F$ contains the algebraic tensor product $E \bigotimes F$ as an ordered vector subspace satisfying density properties. The Fremlin projective tensor product $E\widehat{\bigotimes}F$ of Banach lattices $E$ and $F$ is a Banach lattice, [7]. It contains the Fremlin tensor product $E\overline{\bigotimes}F$ as a norm dense normed lattice. It is known that the Fremlin tensor product $A\overline{\bigotimes}B$ is an $f$-algebra if $A$ and $B$ are $f$-algebras, [4,5]. Also, we know that if $A$ and $B$ are Banach lattice $f$-algebras, then the Fremlin projective tensor product$A\widehat{\bigotimes}B$ of $A$ and $B$ is a Banach lattice $f$-algebra, [9].

A vector lattice $E$ under an associative multiplication is called a lattice ordered algebra whenever the multiplication makes $E$ an algebra with the usual properties and multiplication of positive elements in $E$ is positive. A lattice ordered algebra $A$ is called an $f$-algebra if $x \wedge y = 0$ for every $x, y \in A$ implies $(zx) \wedge y = (xz) \wedge y = 0$ for all $z \in A^+$, where $A^+$ denotes the positive part of $A$. . A Banach algebra $A$ is called a Banach lattice algebra if $A$ is a Banach lattice and the multiplication of positive elements in $A$ is positive. A Banach lattice algebra $A$ is called a Banach lattice $f$-algebra if $A$ is an $f$-algebra.

**Definition 1.** A net $(x_\alpha)$ in an Archimedean vector lattice $E$ is called order convergent to $x \in E$ if there exists a net $(y_\beta)$ satisfying $y_\beta \downarrow 0$, and for any $\beta$ there exists $\alpha_\beta$ such that $|x_\alpha - x| \leq y_\beta$ for all $\alpha \geq \alpha_\beta$.

**Definition 2.** Let $A$ be an $f$-algebra. A net $(x_\alpha)$ in $A$ is called multiplicative order convergent to $x \in A$ if $|x_\alpha - x|.u \to 0$ convergences in order for all $u \in A^+$.

**Definition 3.** A lattice ordered algebra $A$ is called a normed lattice ordered algebra whenever it is a normed vector lattice and $\|x.y\| \leq \|x\|\|y\|$ holds for all $x, y \in A$.

**Definition 4.** A net $(x_\alpha)$ in a normed lattice ordered algebra $A$ is called multiplicative norm convergent to $x \in A$ if $\||x_\alpha - x|.u\| \to 0$ for all $u \in A^+$.

The concept of convergence in $f$-algebras related to multiplication was given before by A. Aydin, [1,2]. The studies under the unbounded order convergence and unbounded norm convergence in vector lattices and Banach lattices were done before by many authors.

O. Zabeti applied the unbounded order convergence to the Fremlin tensor product of vector lattices and the unbounded norm convergence to the Fremlin projective tensor product of Banach lattices in [10].

Our aim is to investigate the multiplicative order convergence in the Fremlin tensor product of two $f$-algebras and the multiplicative norm convergence in the Fremlin projective tensor product of two Banach lattice $f$-algebras.

For this subject, we give the following references.

## References


[1] A. aydin, *Multiplicative order convergence in f-algebras*, Hacet. J. Math.Stat., 49(3), (2020), 998-1005.

[2] A.Aydin, *The multiplicative norm convergence in normed Riesz algebras*, Hacet. J. Math.Stat., 50(1), (2021), 24-32.

[3] C.D. Aliprantis, Owen Burkinshaw, *Positive Operators*. New York: Academic Press, 1985.

[4] Y.Azouzi, M.A. Ben Amor, J. Jaber, *The tensor product of f-algebras*, Queastiones Math., 41(3), (2018), 359-369.

[5] G.J.H.M. Buskes and A.W.Wickstead, *Tensor product of f-algebras*, Mediterr. J. Math., 14(2017),2, paper no:63.

[6] D.H. Fremlin, *Tensor product of Archimedean vector lattices*, Amer. J. Math. vol. 94, (1972),777-798.

[7] D.H. Fremlin, *Tensor products of Banach lattices*,Math. Ann.211,(1974), 87-106.

[8] J.J. Grobler, C.C.A. Labuschagne G.Buskes,*The tensor product of Archimedean ordered vector spaces*,Math. Proc. Camb.Philos., Soc. 104 (1988), 331-345.

[9] J. Jaber, *The Fremlin projective tensor product of Banach lattice algebras*, J. Math. Anal. Appl., 488 (2020), 123993

[10] O. Zabeti, *Fremlin tensor product respects the unbounded convergences*, preprint(2023),ArXiv.